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THIRTY-NINTH ANNUAL REPORT

OF THE

DEPARTMENT OF MARINE AND FISHERIES

1906

FISHERIES

PRINTED BY ORDER OF PARLIAMENT



OTTAWA
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EXCELLENT MAJESTY

1906

*To His Excellency the Right Honourable SIR ALBERT HENRY GEORGE, EARL GREY,
Viscount Howick, Baron Grey of Howick, a Baronet, G.C.M.G., &c., &c., &c.,
Governor General of Canada.*

MAY IT PLEASE YOUR EXCELLENCY :

I have to honour to submit herewith, for the information of Your Excellency and the legislature of Canada, the Thirty-ninth Annual Report of the Department of Marine and Fisheries, Fisheries Branch.

I have the honour to be,


Your Excellency's most obedient servant,

L. P. BRODEUR,

Minister of Marine and Fisheries.

DEPARTMENT OF MARINE AND FISHERIES,

OTTAWA, October, 1906.



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ALPHABETICAL INDEX

TO THE

FISHERIES REPORT

1906.

A

	PAGE
Alberta, report of Inspector.....	xlii, 48, 51
Antigonish County, N.S., returns.....	180
Areas—extent of water—or coast.....	xx
Armstrong, Wm., Hatchery officer, Newcastle, Ont.....	248

B

Baldwin's Mills, rearing ponds.....	253
Bait Freezer system in Canada.....	xlv
Bait, cold storage of, by Peter Macfarlane.....	279
Black Bass, breeding ponds.....	xli, 231
Barker, Wm. H., Hatchery Officer, B.C.....	246
Bay View lobster hatchery, N.S.....	265
Bedford hatchery, N.S.....	261
Behring Sea Question, remarks.....	xlix
" Sealing Fleet of 1905.....	45
Belliveau, A. H., Inspector's reports.....	xl, 80
Bensley, Dr. B. Arthur.....	xv
Bertram, A. C., Inspector of Cape Breton Island, reports.....	xxxv, 155
Biological Marine Station, Gaspé, P.Q.....	xv
" Lake " Georgian Bay.....	xv
Block House Point Hatchery, P.E. Island.....	267
Bon Accord Hatchery, B.C.....	236
Bonaventure County, P. Q.....	33
Bounties Fishing Regulations.....	1
" Statement of claims received and paid, 1905.....	3
" General remarks.....	6
" Statement of claims received and paid since 1882.....	7
" Statement of all vessels receiving bounties, 1905.....	12 etc.
British Columbia, Fisheries Commission.....	xi
" Reports on fisheries by Inspector C. B. Sword.....	xliii, 29
" Reports by Inspector J. T. Williams.....	xliii, 30
" Reports by Inspector E. G. Taylor.....	lxiv, 33
" Reports on fish culture.....	236 to 246
" Seal catch in 1905.....	45
" List of Salmon canneries and pack for 1905.....	36, 37
" Statements of catch and fishing material.....	46, 47
" Special Reports on fisheries of, by Prof. E. E. Prince.....	lix
Bureau, Fisheries Intelligence (<i>See</i> supplement).	

C.

	PAGE
Canso, Lobster hatchery, N.S.	266
Carmichael, Alex. G., report on hatchery (C.B.).....	264
Carp, its invasion of the Great Lakes.....	63
Cape Breton Island. (<i>See</i> Nova Scotia District No. 1) also.....	155
Capital invested in the fisheries of Canada.....	xxix
Catellier, L. N., report on fish culture.....	254
Chapman, R. A., Inspector, N.B., reports.....	xxxvii, 128
Charlotte County, N.B., reports of overseers, &c.....	123, 136
Coast—extent of Canadian Coast line.....	xx
Cod, remarks on.....	lxv, lxix, 78, 101, 157
Colchester County, N.S., statistics of fish.....	176
Commissions, Dominion Fishery.....	xi, xiv
Cowie, J. J., <i>re</i> herring curing.....	xvi
Cruisers, Canadian list of.....	xlix
Culture of fish. (<i>See</i> 'F').	
Cunningham, F. H., Supt. of Hatcheries, report.....	229
Cumberland County, N.S., fishery returns.....	174

D.

Deseve, A. L., Hatchery officer at Magog.....	251
Digby County, returns.....	206
Dogfish reduction works.....	xlvi
Dogfish, remarks on.....	79, 124, 156
Drying fish scheme at Souris, P.E.I.....	xlvi
Duncan, A. G., Inspector, Ont.....	xli

E.

Elliott, Jos., Hatchery officer.....	252
Expenditure of Fishery Services.....	288
" Subdivision by provinces.....	289
" Fish culture.....	290
" Fisheries Protection Service.....	294
" Comparative statement.....	298
Export of fish from Canada.....	xxiii

F.

Fish culture.....	xix
" Report on, for 1906, by Prof. Prince, Dominion Commissioner.....	220
" " F. H. Cunningham, Supt.....	229
" Lobster ponds.....	266
" <i>Re</i> New hatcheries.....	
" Reports of officers in charge of hatcheries.....	236 to 267
" Hatcheries in Nova Scotia.....	261
" " New Brunswick.....	256
" " Québec.....	251
" " Ontario.....	247
" " Prince Edward Island.....	267
" " British Columbia.....	236 to 246
" Expenditure.....	290
" Oyster cultivation. (<i>See</i> letter 'O').....	268, 271
Fisheries Protection Service.....	xlix
Fishery officers, staff.....	
" Bounties. (<i>See</i> letter 'B').	
" Statistical statements (<i>See</i> letter 'S').	
" Season of 1906, remarks on.....	xxxiv
Fraser River, B.C., hatchery (or Bon Accord).....	236
Fry, distribution of.....	221
" Recapitulation since 1873.....	222
Fundy Bay, Fisheries.....	123

SESSIONAL PAPER No. 22

G.

	PAGE
Gaspé Hatchery	256
" County, P.Q.	85
Georgian Bay Fishery Commission	xiv
Georgian Bay Biological Station	xv
Gloucester County, N.B., returns	140, 142
Gourdeau, F., Lt.-Col., Deputy Minister's Report	xi
Grand Manan fisheries	126
Granite Creek Hatchery	241
Guysborough County, N.S.	184

H.

Halibut, remarks on	lxiv
Halifax County, N.S., reports	188
Harris, W. F., Hatchery officer, Bay View N.S.	265
Harrison, H. E., Fishery Inspector reports	xlii, 130
Harrison Lake Hatchery, B.C.	237
Herring, improvement in curing and remarks	xvi
Hockin, R., Inspector's reports	xxxv, 158
Hurley, J. M., Inspector's report	xi
Holroyd, A. W., Hatchery officer, P.E.I.	267

I.—J.

Inspectors of Fisheries, No. (<i>See Staff</i>)	1
" " Reports from. (<i>See each Province</i>)	
Inverness County, N.S., returns	170
Johnson, J. A., Hatchery officer, B.C. report	236

K.

Kemp, Ernest, oyster expert's report	268
Kent County, N.B., returns	140

L.

Lake Superior	66
" Huron	68
" Erie	70
" Ontario	72
" of the Woods	66
" St. Jean, Que.	81, 106
LeBlanc, Nap. S., Hatchery officer at Shemogui	260
Le Vatte, Hy. C., <i>re</i> lobster ponds in C.B.	266
Lindsay, Robt., Hatchery officer, Gaspé	256
Lobster industry, remarks on	79, 110, 125, 162
" hatcheries, N.S. and N.B.	260, 265, 266
Lobster ponds	266
Lunenburg, fishing fleet	198
" County, returns	199

M.

Magog Hatchery, Que.	251
Marine Biological Station report	xv
Magdalen Islands	87
Manitoba Lake	57, 59
Manitoba, report and statistics of Fisheries by Inspt. W. S. Young	xli, 56, 59
Margaree Hatchery, C.B.	264
Matheson, J. A., Inspt. P.E.I., report	xxxviii, 110
Meagher, James, Hatchery officer, Canso, N.S.	266

M—Concluded.

	PAGE
Miller, E. W., Inspector, N.W.T., reports	xlii, 52
Miramichi Hatchery, N.B., report.....	258
Missisquoi Bay fishing.	82, 104
Mitchell, D. S., Hatchery officer, B.C	241
Mowat, Alex., Hatchery officer at Restigouche, N.B	256
McCluskey, Chas., Hatchery officer, report.....	257
McPherson, A. J., Overseer, Lake Winnipegosis.....	57
Macfarlane, Peter, Report on the bait cold storage.....	279
Mont-Tremblant Hatchery, Que.....	252
Museum, Fisheries, report on its exhibits by curator Halket (<i>See Supplement</i>).....	1

N.

New Brunswick, Report on District No. 1, by Insp. J. H. Pratt	xxxvi, 123
" " " 2, " R. A. Chapman.....	xxxvii, 128
" " " 3, " H. E. Harrison ..	xxxvii, 130
" Synopsis of Fishery Overseers' reports.....	126
" Statistics of Fisheries District 1.....	135
" " " " 2.....	140
" " " " 3.....	146
" Recapitulation of Yield and Value of Fish.....	153
" " Fishing Materials.....	154
" List of Vessels receiving bounties.....	23
Newcastle, Ont., Hatchery, report.....	248
Nimkish Hatchery, B.C.....	246
N. W. Territories, Statistics of Fisheries (<i>See Alberta and Saskatchewan</i>).....	61
North Shore Division, P.Q., reports.....	89
Northumberland County, N.B., returns.....	140
Nova Scotia, Report District No. 1, A. C. Bertram.....	xxxv, 155
" " " 2, R. Hockin.....	xxxv, 158
" " " 3, A. C. Robertson ..	161
" Statistics of Fisheries Districts Nos. 1, 2, 3.....	164, 174, 197
" Recapitulations, Yield and Material.....	214, 218, 219
" List of Vessels receiving bounties	12

O.

Ontario, remarks on fisheries.....	62
" statistics of Fisheries.....	66 to 76
" statement of fishing materials.....	77
Oyster Culture, also their transplantation by Mr. E. Kemp	268, 271
Ogden, Alfred, Hatchery officer, N.S	261
Ottawa Hatchery.....	249
'Ostrea' (Dom. Steamer for oyster culture).....	268

P.

Parker, Wm., hatchery officer, Sandwich, Ont.....	247
Pelagic sealing.....	xlix
Pemberton Hatchery, B.C.....	238
Picton County, N.S., reports.....	178
Ponds for breeding fish.....	iv, 231, 253, 266
Prince Edward Island, Report on fisheries, Inspector J. A. Matheson ..	xxxviii, 110
" Statistics of Fisheries	113
" " Fishing Material	122
Prince, Prof. E. E., Commissioner, report on Fish Culture.....	220
" " Marine Biology	xv
" " Special articles on :—	
" " How to establish a trout pond	lv
" " The Pacific fishing industry of Canada	lix
Pratt, Capt. J. H., Inspector, N.B., reports	xxxvi, 123
Protection Service (<i>See supplement</i>).....	xlix

SESSIONAL. PAPER No. 22

Q.

	PAGE.
Quebec, Reports on the Gulf St. Lawrence, by Dr. Wm. Wakeham	xxxviii, 78
" " Inland Divisions, by A. H. Belliveau and Jos. Riendeau.....	xxxix, lx, 80
" Statistics of Fisheries for Gulf Division.....	83 to 101
" " " Inland Divisions.....	102 to 107
" Recapitulation of yield of fisheries and materials.....	108, 109

R.

Revenue, statement of	297
" Comparative statement of	298
Report of Deputy Minister.....	xi
Report of Inspectors. (See also each province).....	xxv
Restigouche hatchery, N.B.....	256
" County returns.....	140
Richmond County returns	164
Riendeau, Joseph, Inspector's report.....	xxxix
Rivers Inlet Hatchery, B.C.....	244
Robertson, Alex., Officer Pemberton Hy., B.C.....	238
Robert, Alphonse, Hatchery officer, Que.....	252
Robinson, Thos., Hatchery officer, Harrison Lake, B.C.....	237
Roxbury, Wm., Hatchery officer.	45

S.

St. Alexis Hatchery, P.Q.....	252
St. John River, District, N.B.....	130, 146
" Hatchery, N.B.....	257
Sandwich Hatchery, Ont	247
Saguenay County, North Shore.....	89
Salmon, remarks on.....	lx, 33, 128, 131, 158
Saskatchewan, reports and statistics.....	xlii, 52, 55
Scottish methods of curing herring	xvi
Seals, Behring Sea, remarks	xlix
Selkirk Hatchery, Manitoba.....	234
Sheasgreen, Isaac, officer Miramichi Hatchery, N.B.....	258
Shelburne County returns.....	202
Shemogui Lobster Hatchery, N.B.....	260
Sheppard, O. B., Inspector, Ont., report	xli
Shippegan Lobster Hatchery, N.B., officer 'Savoy'.....	260
Skeena River Hatchery, B.C.....	263
Spain, O. G. V., Commanding Marine Service of Canada. (See supplement).....	
Special Reports by Prof. E. E. Prince	lv-lix
Staff, Outside officers.....	1
Statistics of Fisheries (See each province).....	xxiv
Statements recapitulating the value of fish since 1870.....	xxviii
" " Fishing gear, etc.....	xxx
" " Number of fishermen	xxxiii
" the catch of fish in detail. (See each province).....	
Storage of Bait frozen.....	xl, 279
Sword, C.B., Inspector, reports.....	xliii, 29, 35

T.

Tadousac Hatchery report.....	254
Taylor, E. G., Inspector, report.....	xliv, 33, 42
Trout-pond, how to establish.....	lv

U.

United States, fishing vessels, <i>Modus Vivendi</i> licenses.....	297
--	-----

V.

	PAGE
Value of Fisheries. (<i>See also each province</i>).....	xxi
Victoria County, N.S.....	168

W.

Walker, John, Hatchery officer, report.....	249
Wakeham, Wm., M.D., reports on Gulf St. Lawrence fisheries.....	xx xviii, 78
Westmorland County, N.B., returns.	140, 142
Windsor Hatchery, N.S.....	263
Winnipegosis Lake.....	59, 60
Williams, J. T., Insp. of Fisheries Northern B.C., reports.....	xlili, 30, 38
Whitwell, Thos., Hatchery officer, B. C.....	243

Y.

Yarmouth County returns.	204
Young Wm. S., Inspector, Manitoba, reports.....	xli, 56, 59
Young, Harrison S., Inspector, N.W.T., reports.	xlil, 48

REPORT OF THE DEPUTY MINISTER.

To the Honourable L. P. BRODEUR,
Minister of Marine and Fisheries.

SIR,—I have the honour to present the thirty-ninth annual Fisheries Report of the Department of Marine and Fisheries for the fiscal year ending on June 30, last, and to give a statement of the more important details of the Fisheries Branch up to date.

This report contains statements of expenditure and revenue, of the Fishing Bounty transactions, Fisheries Protection Service, Fish Hatcheries, Oyster Culture on the Atlantic and Pacific coasts, Scottish herring curing work in Canada, Bait Freezers, Dogfish Reduction Works, Fish Drying Scheme, and the several reports of the District Fishery Inspectors in the different provinces. Appended to the report will be found, as usual, two special articles by Professor Edward E. Prince, Dominion Commissioner of Fisheries, upon 'How to establish a Trout Pond', and 'The Pacific Fishing Industries of Canada.'

The appendices referred to above, follow in order :—

- Nos. 1. Fishing Bounties.
2. British Columbia Fisheries.
 3. Alberta "
 4. Saskatchewan "
 5. Manitoba "
 6. Ontario "
 7. Quebec "
 8. Prince Edward Island Fisheries.
 9. New Brunswick "
 10. Nova Scotia "
 11. Fish Culture Operations.
 12. Bait Cold Storage.
 13. Fisheries Expenditure and Revenue.

BRITISH COLUMBIA FISHERIES COMMISSION, 1905-06.

The members of the British Columbia Fisheries Commission, appointed by Order in Council, approved by His Excellency the Governor General on July 22, 1905, continued their work during the salmon fishing season of the present year.

6-7 EDWARD VII., A. 1907

By the order appointing them they were empowered to hold conferences with the authorized United States representatives, in the state of Washington, with a view to reaching some common ground of action, and formulating some mutual fishing regulations for the contiguous Pacific waters of both countries. They were instructed to visit the centres of the salmon industry and the various fishing localities on both sides of the international line. They were also instructed to take evidence at public sittings in British Columbia and make such inquiries and investigations as appeared necessary in order to make such report and recommendations as would enable the Minister of Marine and Fisheries to submit to the government for sanction regulations which will best preserve, protect and develop the fishing industries of British Columbia.

When on June 6th, 1905, the late Minister of Marine and Fisheries (Hon. Raymond Préfontaine) informed the Hon. the Governor of Washington State, by letter, that a B.C. Fishery Commission was about to be appointed to thoroughly investigate the salmon and other fisheries of the Pacific waters of Canada, he called attention to the fact that 'the interest of the salmon fisheries of Washington State are bound up with those of the Fraser river, and adjacent waters of British Columbia' and it therefore appeared desirable that conferences or joint sittings should be held of the Canadian Commissioners and a commission representing the state of Washington. 'No doubt you are aware' added the late minister in his letter 'of the widespread feeling that some such mutual conferences should be held, with a view to the formulation of joint fishery regulations for the contiguous waters of the Straits of Georgia, Puget Sound, and the Strait of Juan de Fuca.' In his reply, dated Olympia, June 13th, 1905, the governor (the Hon. Albert E. Meade) stated that he would immediately appoint a commission 'consisting of the Fish and Game Commissioner of the state and three other gentlemen familiar with the fishing industry which commission will be pleased to sit with the Canadian Commission alone or in connection with commissioners named by other northern boundary States' and he promised to forward the names of the commissioners, when appointed, 'to the end that an immediate place and date of meeting may be arranged at the earliest possible moment.' Subsequently other commissioners were added making the total number seven, namely :—

Mr. T. J. Gorman, Seattle, Chairman.

Mr. E. B. Deming, Bellingham.

Mr. J. C. Kerr, Seattle.

Mr. E. E. Ainsworth, Seattle.

Mr. Frank Wright, Bellingham.

Mr. A. H. Woolard, Bellingham.

Capt. Riesland, State Fish Commissioner.

The British Columbia Commission consists, it may be added of the following members :—

Professor E. E. Prince F.R.S.C., F.L.S. &c., Ottawa, Chairman.

Mr. Campbell Sweeny, Vancouver.

Mr. John C. Brown, New Westminster.

Mr. Richard Hall, M.P.P., Victoria.

Rev. George W. Taylor, F.R.S.C., F.L.S., &c., Wellington.

Mr. J. P. Babcock, Provincial Fishery Commissioner, Victoria.

SESSIONAL PAPER No. 22

The duties of Secretary of the Commission have been performed by Mr. J. Charles McIntosh, barrister-at-law, Victoria, B.C.

As empowered by the Order in Council (July 22, 1905) appointing them Commissioners, and as directed by the instructions appended to the said Order in Council, they have, in addition to sittings for the taking of evidence, and visits to the various fishing grounds in all parts of the coast, besides numerous private executive sittings, held 'conferences with United States' representatives in Washington State, and made visits to selected centres and to fishing grounds on both sides of the International Line.' At these conferences the Canadian Commissioners thoroughly and exhaustively discussed the question involved, so that the Canadian contentions were thoroughly elucidated.

To briefly summarize the commission's proceedings it may be stated that, after preliminary executive sitting in Victoria on Sept. 19th and 20th, 1905, and the appointment of committees, one to investigate the herring fishery, especially near Nanaimo, the other to inquire into and report upon suggested topographical limits to be defined for fishing salmon in the Fraser river, an adjournment was made until November. On Nov. 10th and 11th, 1905, the British Columbia Commissioners met the Washington Special Commission, in Seattle, and held a lengthy preliminary discussion on the more important points arising in connection with the sockeye fishery in the Fraser river and the contiguous waters of the Straits of Georgia, Puget Sound, and the Straits of Juan de Fuca.

As public sittings had, up to that period, not been held by the British Columbia Commissioners and no evidence had been taken, and as the Washington State representatives had not formulated their views or drawn up any suggestions for a code of mutual fishery regulations; it was agreed to adjourn to meet at some future convenient date, with the understanding that statistical and other information should be prepared by both commissions, and certain reports and documents mutually furnished by one commission to the other.

At the conclusion of the Seattle Conference, the chairman of the Washington Special Commission (Mr. T. J. Gorman) said. 'We believe that a great deal of good has been accomplished in the meetings. We feel with the provisions made for data to be furnished at the future conference to be held, that we can without difficulty arrive at a satisfactory conclusion in regard to the matters in which we are all so much interested.'

Further executive sessions were held in November, as well as public sessions at which 112 witnesses were heard and a large mass of valuable testimony was received.

The adjourned sittings were resumed in Vancouver on June 20, when arrangements were completed for making a tour of the United States traps and canneries in Puget Sound and the trap-nets in British Columbia waters west of Discovery Island, near Victoria. This tour in company with the members of the Washington Special Fishery Commission, from Bellingham to Anacortes, and by Rosario straits to Point Roberts and Blaine, yielded much valuable information, and the visit immediately thereafter to the British Columbia traps in Fuca straits put the British Columbia commission in possession of the actual facts relating to the fishing localities and fishing operations. During this tour it was arranged that the further proposed international

6-7 EDWARD VII., A. 1907

conference should be held in Vancouver on September 19. At this conference, in the Board of Trade rooms, Vancouver, the members of the British Columbia commission made a formulated statement of views and recommendations which a majority of the commissioners felt prepared to adopt, providing that Washington special Fishery Commission had some adequate recommendations to make to the Washington State legislature with a view to the mutual preservation of the sockeye salmon supply in contiguous waters. The main contention of the Washington State representatives was that a weekly close time for sockeyes of 36 hours in their waters is rendered ineffective, owing to the alleged excessive gill-netting carried on in the Fraser river above New Westminster Bridge (that is to say, between New Westminster Bridge and Mission Bridge, a distance of 38 miles). The Washington special Fishery Commission stated their willingness, as far as they are able, to secure the continuance of the 36 hours close time, each week, in their waters, if all gill-netting for sockeyes be prohibited in the Fraser river, between the two bridges named. Such a prohibition, it is contended, would ensure the preservation, and possibly, the increase of the supply of sockeye salmon in the Fraser river. At this second international conference held on September 19, in the Board of Trade rooms, Vancouver, a final interchange of views took place with the result that mutual conclusions were arrived at. These conclusions of the Washington State commission will be embodied in their report which, it is expected, will be laid before the State legislature when it assembles in Olympia about the middle of December. The recommendation of the British Columbia Fishery commission are tabulated in an interim report forwarded to Ottawa early in October. It includes a minority report on points upon which the commission was unable to come to a unanimous decision.

A considerable amount of work still remains for the British Columbia Commissioners to complete ; but it is possible that a full and final report including a revised code of suggested fishery regulations for the province of British Columbia will be prepared during the winter and after full discussion will be presented in due course, when the work of the commission will then come to an end.

GEORGIAN BAY FISHERY COMMISSION.

During the year 1906 the further sittings of the commission, referred to in last year's report, have been held, two of the commissioners (Mr. John Birnie, K.C., and Mr. J.J. Noble) carrying on the work most assiduously in spite of the absence of the chairman (Professor Prince) who was closely engaged with important fishery duties on the Pacific coast.

In February, Mr. Birnie attended in Ottawa and, with Professor Prince, reviewed most of the evidence with a view to the compilation of an Interim Report, and later Mr. Noble also discussed in the office of the Commissioner of Fisheries, some of the more salient points.

On March 13th, the commission met in Toronto and took a large amount of important evidence largely referring to the decrease in the game fish of Georgian bay. At the second day's sitting on March 14th, still further evidence was taken, and after a third sitting on March 15th, the commission adjourned to meet in Collingwood on the 17th and 19th of March. Unfortunately, owing to serious indisposition, Mr. Noble was not present at the Toronto or Collingwood sittings. Later in the year the com-

SESSIONAL PAPER No. 22

missioners, with the exception of the chairman, continued there tour of the Georgian bay fishing localities, and took evidence from Midland on July 24th, to Kagawong early in September. There still remain to be visit'd Spanish river, Cutler, Algoma Mills, Blind river, Thessalon, and Sault St. Marie, and strong representations have been made that evidence should be heard from fishermen further south including Windsor, and other St. Clair and Detroit river points. The commissioners feel that, in order to satisfactorily settle the very important questions which have been laid before them by the fishermen, fish-merchants, anglers and others, they will require to extend their investigations. They will thus be enabled to present a far more satisfactory and conclusive report, and make recommendations likely to assist the Hon. the Minister in his decision upon the matters in controversy.

MARINE BIOLOGICAL STATION.

The Marine Biological Station has passed a second year at Gaspe and has continued the important fishery investigations commenced in 1905.

Dr. Stafford again acted as curator and pursued his researches into vertebrate and invertebrate life in the waters off Gaspe. He will add considerably to his faunistic results, and as these afford insight into the nature and location of the food, which attracts the marketable fishes to their recognized haunts, interesting reports will be made in due course. Professor Knight, who has made so many contributions to fishery knowledge of the highest practical importance, carried on some experiments as to the comparative merits of frozen and of fresh bait. The conclusions, drawn from these experiments, will be published, and will be of unique interest, as the matter is one upon which the opinions of practical men all along the Atlantic coast are divided. Amongst the staff of workers, were several distinguished students and assistants from McGill, Toronto, and other universities.

The question of deciding upon a permanent site for the Biological Station was discussed at the meetings of the board of management in Ottawa in January and in May and a committee was appointed to examine a number of localities in the maritime provinces and report to the next board meeting.

The suggestion for a British Columbia Biological Station, at some suitable place on Vancouver Island has been before the board, and was urged by the Rev. G. W. Taylor F.R.S.C., of Wellington, near Nanaimo. Inasmuch as United States scientific men have actively carried on investigations in the Pacific waters of Canada, and one United States Marine Station has been equipped and has been in operation on the west coast of Vancouver Island, the urgency of immediately commencing Canadian biological investigations in these prolific and unparalleled waters is recognized. The British Columbia Fishery Commission have, it is understood, strongly pressed the matter, and steps should be taken without delay to equip a small station and commence fishery researches early next season. Professor Prince and Rev. Mr. Taylor did some work, under the British Columbia Commission, with most fruitful results.

GEORGIAN BAY BIOLOGICAL STATION.

The staff of this Station, under the skilled guidance of Dr. B. Arthur Bensley has actively carried on its work as in previous seasons. Reports are in preparation, which

6-7 EDWARD VII., A. 1907

will probably be published with the fishery investigation results of the Marine Biological Station. The Georgian Bay Commission have not been able to formulate the special researches, which in their opinion would aid them in deciding crucial matters in the waters of Western Ontario. Next season these definite problems will be laid before the staff of the station, and their solution will no doubt follow the exact scientific study which the staff will be able to bestow upon them.

Professor Knight and Professor Prince had arranged to visit the station during the season, under authority of the Biological Board; but the visit was not possible.

The fine collection of fish specimens formed at the station has been greatly added to, but, for details of the researches reference must be made to the forth coming reports now in preparation.

SCOTCH HERRING CURING EXPERIMENT.

Reference to this important innovation in the Canadian herring industry, will be found in the thirty-seventh annual Department Report, Fisheries, 1904, page lxxxiii, and in the thirty-eighth annual report, Fisheries, pp. xxvii. and cviii.

This experiment has been conducted under the auspices of the department in charge of Mr. J. J. Cowie, of Lossiemouth, Scotland, an expert Scottish fish curer, thoroughly versed in the methods and trade connections, for the past three years.

The facilities provided embrace an up to date steam drifter, built in Great Britain, and brought across the ocean by the department; gangs of Scotch drift nets, three fishermen, one cooper and six girls. Also imported barrels and salt necessary for the success of the venture in its entirety.

During the first season 1904, the operations were carried on with Canso, Nova Scotia, as a base, both in the spring and fall fishery, and proved in every way satisfactory as demonstrating that the Canadian herring was capable of the same treatment as the Scotch herring; that the fish itself is equal, if not superior, to those on the other side of the Atlantic, and that the product of the experiment so treated was capable of realizing prices equal to those of the Scotch article in the markets of United States and Russia.

During the year 1904, after the Atlantic herring season terminated, Mr. Cowie, with a portion of his staff, proceeded to Nanaimo, British Columbia, where he demonstrated to those interested in the business on the Pacific coast, the Scottish methods as applicable to the conditions obtaining there.

For the season of 1905, Mr. Cowie's operations so far as the spring fishery was concerned were repeated at Canso, but the fall fishery branch of the experiment was conducted at Yarmouth, and Clarke's Harbour, Shelburne County; the details of which are described in the Departmental Report of Fisheries for that year. As in the previous year, his field of operations was again removed in the fall to the Pacific Coast.

This season, the efforts of the Department in this respect, have been confined to the Bay des Chaleurs, where the full season, embracing both spring and fall branches, has been carried on with Caraquet, N.B., as a base of operations.

SESSIONAL PAPER No. 22

It may be said that hitherto the spring run of herring in these waters has been of no commercial value to the fishermen and handlers of herring, inasmuch as no concerted attempts have been made, since the termination of the fishery articles of the Treaty of Washington, to utilize this branch of the herring fishery in a legitimate business way. The herring at that season having been regarded as of no particular value, such as were taken were devoted principally if not wholly to the fertilization of the land by the local farmers.

The feasibility of the utilization of these fish at highly remunerative prices, has created a most favourable impression among the fishermen on both sides of the Bay des Chaleurs, and their eyes have been opened to great future possibilities in this direction, and good results are expected to accrue immediately. Not only has it been demonstrated that a highly remunerative branch of the fishery has been wholly neglected, but it has been shown that the methods hitherto adopted in the prosecution of the fishery, irrespective of the handling and curing of the fish, have been primitive and only partial in its character. The efforts made by the local fishermen have been confined principally to inshore or local operations, the failure of which having been sufficient to convince the operators of the absence of fish, engendering a corresponding lassitude in their attempts at exploitation.

The spectacle, however, of the Department's steam drifter starting out in the evening to fishing grounds any distance up to 80 miles or so off shore, and returning the following forenoon with a substantial catch of fish, has awakened the fishermen to the fact that the fish are to be found offshore in localities where they have previously not been sought by their methods, although perhaps not to be encountered inshore where their operations have been confined. The Department having decided upon the Bay des Chaleurs as the base of the year's work, in order that nothing should be left undone to make the experiment complete in all its branches. Mr. Cowie and his staff arrived in the county in time to make arrangement for the earliest catches, and the steam drifter which had to winter at Canso, reached the Bay des Chaleurs on the 28th April, but owing to the prevalence of ice, it was found impossible to enter Caraquet Harbour until the 1st May, but fishing operations were further prevented by ice until the 8th of that month.

The staff consisted of a crew of eight men for fishing operations on the steamer, and six girls and one cooper for curing and packing on shore.

The first catch of herring was landed on the 9th May, and from that date forward the spring fishery continued more or less regularly until the 14th June.

The quantity of spring fish taken to that date being 504 barrels and these contrary to the expectations of the local fishermen were taken in deep waters all over the bay, showing the bay to be full of fish.

The spring fish were found to be in good condition up to the middle of May, full of milt and roe and pronounced by Mr. Cowie to be quite equal to the "full" fish taken on the east coasts of England and Scotland.

About that date spawning takes place after which the spring herrings become thin which deterioration renders them practically useless for pickling according to the

Scottish standard, so that of the spring catch, not more than 240 barrels were curable, the balance being taken into the local fishermen's bait freezers, for baiting purposes.

In the beginning of July, while fishing about 40 miles from Miscou Point, and about 25 miles from Gaspé coast, the steamer came upon some fine large fat "Matjes" of which 58 barrels were landed. The "Matje" it may be here explained is a herring without roe or milt, but fat and well flavoured; in other words, herring which having already shed their spawn, and passed their sick period are feeding and fattening before again filling up with roe or milt. Such fish are cured by a process, which contemplates their immediate consumption during the summer months.

During the remainder of July the herring appeared to be scarce.

On August 8, the first of what is known as the 'fall' run of herring was struck in the Gulf about 12 miles from Miscou, and were caught there in quantities varying from 10 to 16 barrels until about the end of the month, when fish appeared inside the bay and some were taken there up to about the end of September.

For a few nights fair quantities were taken by a fleet of 60 local boats on the inshore grounds. These finished fishing, however, about the first or second week in September, their average catch being about 20 to 30 barrel of fall fish.

The steam drifter ceased operations having caught 272 barrels of fall fish, the whole of which were curable.

Mr. Cowie remarks that the fall catch of the Bay des Chaleurs is comprised of the largest and fattest herring that he has ever seen, and nowhere around the British Isles are herring caught to equal them.

During the month of May visits were made to Bonaventure and Gaspé Counties, where demonstrations in curing were given, the fishermen and others evincing the liveliest interest in the work and apparently appreciating the possibilities of a new industry along these educational lines.

One Caraquet firm has made a start to cure in the Scotch style employing, local girls and having the fish cured on shore in uniform barrels, while others on both sides of the bay are said to be making arrangements for taking advantage of the plentiful spring run of herring next year. To secure the largest quantities of curable spring herring before they have spawned, the fishery ought to begin about April 20, when a full month's fishing of good marketable fish could be secured. At some places on the south shore of the bay the presence of ice would probably prevent so early a start, but the experience of this year is that a sufficiently early beginning could be made on the north shore, where the ice leaves earlier, permitting of full advantage being taken of the spring fishery at its best stage.

This part of the coast, Mr. Cowie believes to be a never failing resort of herring in the spring and fall with the seasons fairly well defined, he considers that a regular herring, curing and exporting business could be built up there similar to that in Scotland.

With only one boat drifting in this extensive area, the chances of striking the schools of fish are comparatively very small, nevertheless what the steamer has done

SESSIONAL PAPER No. 22

this year, has caused the fishermen of the bay to recognize the advantages of drift net fishing, and that with their own boats fitted for drifting with a fleet of about fifteen nets, herring in quantities could be caught in the deep water, long before they reach the inshore areas, and when they are in the best condition, especially in the fall.

It is interesting to note that towards the end of July, mackerel appeared to be plentiful, about 5,000 being caught by the drifter, which would seem to indicate the possibility of a lucrative mackerel fishery by drift nets in the bay.

The spring fish and 'Matjes' are now in the New York market, and advices of their sale and prices realized have not yet been received.

The fall fish and mackerel are being got ready for shipment.

At the beginning of the present season, the department published a fisheries bulletin, embracing full instructions for the curing and packing of 'Full' and 'Matje' herring, and the construction of barrels in the Scottish method as applicable to the Atlantic provinces of Canada, which will be embraced in Mr. Cowie's report of the season's operations appearing in the supplement to this report.

FISH BREEDING.

The Commissioner of Fisheries presents his annual report on fish culture, and the details covering the past season's operations as conducted at the various fish breeding establishments by this department are included in the reports of the officers connected with this service, and form Appendix No. 11, of this report.

Several new establishments have been operated for the first time and the uniform success of the season's work is a matter of congratulation to all connected with this important branch of the service.

The distribution of the large numbers of young fish from the thirty-two hatcheries now in operation throughout the Dominion is a serious and in many cases very expensive matter. Under the present system of stocking by application, long distances have to be covered by rail and team, and it often occurs that difficult portages are involved. Reference was made in last year's report to the system of stocking by localities and whilst this suggestion has been carried out wherever possible, it is a system that might well be adopted by the department on a more extensive scale.

The rearing-ponds at Lake Lester and the Black Bass ponds on the Bay of Quinte have been operated successfully and the lobster ponds at Fourchu, N. S., under the supervision of Mr. H. E. Baker have again resulted in a successful season's work.

OYSTER CULTURE.

The report of the Department's Oyster Expert for the season of 1906 forms Annex C. to Appendix 11 of this report. Mr. Kemp divided his time between the oyster beds of Prince Edward Island and those of Shediac, N. B.

This officer ends his report with a few extracts from a lecture given by him on the subject of private cultivation of oysters. While briefly stating what has been done in other countries, he surmises what could be performed at home.

GENERAL STATISTICS *RE* FISHERIES.

EXTENT OF COAST.

The fisheries of Canada are the most extensive in the world, extending over our immense sea-coast line, besides our innumerable lakes and rivers.

The Eastern sea coast of the maritime provinces from the Bay of Fundy to the Straits of Belle Isle covers a distance of 5,600 miles, which is more than double that of Great Britain and Ireland.

While the salt water inshore area, not including minor indentations, covers more than fifteen hundred square miles, the fresh water area of that part of the great lakes belonging to Canada is computed at 72,700 square miles, not including the numerous lakes in Manitoba and other western districts all stocked with excellent species of food fish.

FISHERIES EXPENDITURE AND REVENUE.

The statement of the total expenditure for the different services connected with the fisheries of Canada during the last fiscal year will be found in Appendix No. 13 of this report.

The total fisheries expenditure amounts to \$968,722 subdivided as follows :

Fisheries proper \$155,929, fish culture \$209,376, fisheries protection service \$249,876, miscellaneous expenditure \$194,994, including also \$158,546 distributed as fishing bounties.

The net total amount received as revenue from fishing licenses, fines, &c., during the same period in the different provinces of Canada, is given as \$98,009. This sum also includes \$14,568 received from the United States fishing fleet as *modus vivendi* license fees.

A comparative statement of all the fisheries expenditure and revenue for the last fifteen years concludes this appendix.

For fuller details of these different fishery expenditures, see Auditor General's Report under their several headings.

BOUNTIES FOR FISHING.

The deep-sea fishermen of the maritime provinces received the sum of \$158,546 as bounties on their respective catches of fish, for the season of 1905.

Of this amount, the owners of 922 fishing vessels and their crews received \$71,502. The balance \$87,044 was distributed amongst 20,501 boat fishermen.

For the past season the province of Nova Scotia received nearly double the amount of bounty paid to the other three provinces, viz. :—\$100,664 ; Quebec, \$34,185 ; New Brunswick, \$15,379, and Prince Edward Island, \$8,317.

SESSIONAL PAPER No. 22

Since its inception (1882) the sum of \$3,790,685 has been distributed amongst the fishermen of the above named provinces to enable them to better develop their industry.

The regulations governing the payment of such fishing bounties as well as all particulars respecting their distribution form the first appendix of this report.

VALUE OF THE FISHERIES OF CANADA.

The whole catch of fish in our waters by Canadians, including fish products, seals, &c., during the season of 1905, aggregates the large sum of nearly *twenty nine and a half million dollars*; nearly as much as the total production of both gold and coal in the Dominion, during the same period.

It is a record breaking season, exceeding by over four million dollars the large output of 1901, and by over six million dollars the yield of the previous year, which was considered a very good season.

A glance at the following statements will easily demonstrate where this enormous surplus comes from. The province of British Columbia alone shows the vast increase of over four and a half million dollars.

For the first time in the history of our record, has Nova Scotia been superseded as the banner fish producing province of Canada. Although it shows an increase of nearly one million dollars over the yield of 1904, yet the Pacific province heads the list by \$1,600,000.

The following table shows the total value of the fisheries of each province in their respective order of rank with their increases or decreases as compared with 1904:

Provinces.	Value of Fish.	Increase.	Decrease.
	\$	\$	\$
British Columbia.....	9,850,216	4,631,109	
Nova Scotia.....	8,259,085	971,986	
New Brunswick.....	4,847,090	176,006	
Quebec.....	2,003,716	252,319	
Ontario.....	1,708,963		84,266
P. E. Island.....	998,922		78,624
Manitoba.....			
Saskatchewan.....	1,811,570	94,593	
Alberta.....			
Totals.....	29,479,562	6,126,013	162,890
Net increase.....		5,963,123	

With the exception of Prince Edward Island, showing a slight diminution, the other maritime provinces all show substantial improvement as compared with the yield of fish of the previous season.

In fact, the two large increases indicated above come from the extremes of the Dominion separated by three thousand miles, thus proving the immense area from which our piscine wealth is derived.

6-7 EDWARD VII., A. 1907

While the inland waters of the these western or central provinces show an increase of nearly \$100,000, consisting chiefly of whitefish pickerel and pike, Ontario has a falling off of about an equal amount.

Notwithstanding the large estimates of fish for domestic consumption in British Columbia, it is said to be far under the immense quantities used by the Indian population of that province as well as that of the Yukon district and other remote parts of the Territories where fish food is a staple article.

The various features in the fisheries of each province are fully explained by our different inspectors in their respective reports, forming appendices from two to ten of this publication, as well as in their preliminary reports herewith.

The following statement shows the relative values of the principal kinds of the commercial fishes (above \$100,000) for the year 1905 as compared with those of the previous year.

Kinds of Fish.	Value.	Increase.	Decrease.
	\$	\$	\$
Salmon	8,989,942	5,120,397	
Lobsters	3,906,998	215,847	
Cod	3,421,400		222,254
Herring	2,303,485	146,996	
Whitefish	1,051,161		7,651
Mackerel	958,223	207,826	
Sardines	878,372	87,931	
Haddock	806,743	167,770	
Pickarel	784,988	146,421	
Trout	735,768		46,372
Halibut	616,735		167,829
Hake	447,665	84,531	
Smelts	433,147		14,432
Pollock	323,032	87,214	
Clams	269,851	54,513	
Pike	227,064		25,789
Sturgeon	198,778		42,932
Oysters	174,300		12,385
E-ls.	127,708		2,236
Alewives	121,640		33,976

The quantity of fish used as bait in the season of 1905 is valued at \$455,900, and that of fish oil at \$259,480.

The fur seal skins secured by the British Columbia hunters during the same period realized \$331,152.

In past years, there seemed to have been an apparent struggle between salmon, lobster and cod for first place, but a glance at the above list shows the largest fluctuation ever recorded in our fishery statistics. Owing to the phenomenal catch of salmon in the British Columbia waters, that king fish not only heads the list with an aggregate value of nearly nine million dollars, exceeding the previous output by over five million dollars, but beating the famous record of 1901 by over one million dollars. This year the value of the salmon industry equals the combined productions of lobsters, cod and herring together. While the capture of salmon was considerable in the maritime provinces, the above mentioned extraordinary result is chiefly attributed to the enormous yield of

SESSIONAL PAPER No. 22

British Columbia, whose fishermen were expecting a big run, as it was a fourth year and they were not disappointed. At times, the run was so large that cannery had to limit the boats to 200 fish each per day, not being able to handle more. The quantity of salmon salted or disposed fresh was also larger than usual. Altogether, no less than eighty one million pounds of salmon were contributed to the industry by the western province during last season.

Not only did the lobster industry again hold its own, but the season of 1905 shows an improvement of nearly a quarter of a million dollars over that of 1904.

This, however, must be ascribed to more remunerative prices received, especially for live lobsters shipped to Boston and neighbouring markets, as the pack of last season was less than the previous one, being given at about ten million and a half lb. cans, while there was 43,000 cwt. more of crustaceans disposed of in the shell than in 1904.

Lobsters were reported more plentiful in the waters in the proximity of the hatcheries of a few years' existence, but they were of a smaller size.

Of the twenty species whose value exceed the \$100,000, the two most noticeable shortages are in cod and halibut, while the others are of minor importance. The other branch of the cod family as haddock, hake and pollock show fair improvement. Mackerel and herring also yielded much in excess of the previous season.

Of the fresh water species, pickerel alone shows a surplus yield, while whitefish, trout, pike and sturgeon have fallen off.

From the year 1869 to 1905 inclusive, the five principal commercial sea fishes have yielded the following values to the industry :

Cod	\$136,043,567
Salmon	90,933,459
Lobsters	79,868,626
Herring	72,565,569
Mackerel	46,047,244

EXPORT OF FISH.

During the last fiscal year, the fish and fish products including marine animals exported from Canada to foreign countries, chiefly to the United States and Great Britain, amounted to \$16,040,000, being an increase of over five million dollars over the previous export. This surplus export corresponds well with the increased production.

6-7 EDWARD VII., A. 1907

RECAPITULATION.

Of the Yield and Value of the Fisheries of the Dominion of Canada for the Year 1905.

Number.	Kinds of Fish.	Quantity.	Value.	Total.
			\$	\$
1	Cod, dried Cwt.	738,637	3,323,866	3,421,400
	" fresh or green Lb.	1,876,000	81,264	
	" tongues and sounds Brls.	1,627	16,270	
2	Haddock, dried Cwt.	99,788	259,364	806,743
	" fresh Lb.	11,520,134	245,604	
	" smoked (finnan haddies) "	2,696,250	161,775	
3	Hake, dried Cwt.	173,694	390,813	447,665
	" sounds Lb.	113,705	56,852	
4	Pollock Cwt.	161,516		323,032
5	Tom cod or frost fish Lb.	2,542,200		80,301
6	Halibut "	10,618,062		616,735
7	Flounders "	1,346,774		45,583
	Salmon, preserved in cans. "	56,016,511	6,623,600	8,989,942
8	" fresh "	11,695,089	1,482,371	
	" smoked "	465,230	48,446	
	" pickled or dry salted "	16,653,200	835,525	
9	Trout (all kinds) "	8,288,878		735,768
10	Ouaniche "	11,000		1,100
11	Whitefish "	14,548,310		1,051,161
12	Smelts "	8,662,950		433,147
13	Oulachons "	989,500		49,950
	Herring, salted Brls.	301,740	1,382,509	2,303,485
14	" fresh Lb.	18,949,040	542,702	
	" smoked "	16,335,080	341,394	
	" kippered "	368,800	36,880	
15	Sardines, preserved in Cans.	3,672,000	183,600	878,372
	" fresh or salted Brls.	343,756	694,772	
16	Shad, fresh or salted Lb.	1,253,150		63,197
17	Alewives Brls.	30,410		121,640
18	Pike Lb.	6,337,860		227,064
19	Maskinongé "	7,270		727
20	Eels, salted Brls.	7,743	77,430	127,708
	" fresh or smoked Lb.	837,960	50,278	
21	Perch "	1,121,100		37,591
22	Pickarel "	10,966,825		784,988
23	Bass (achigan) "	46,200	4,620	23,653
	" (striped or sea) "	190,330	19,033	
24	Mackerel, salted Brls.	40,409	606,135	958,223
	" fresh Lb.	2,934,068	352,088	
25	Sturgeon "	1,478,595	144,976	198,778
	" caviare "	58,800	53,802	
26	Lobsters, canned "	10,497,624	2,624,406	3,906,998
	" fresh or alive Cwt.	154,014	1,282,592	
27	Oysters Brls.	34,449		174,300
28	Clams, quahaugs and other shell fish "			269,851
29	Squid "	23,246		92,984
30	Coarse and mixed fish "	94,825	189,900	858,514
	" " Lb.	19,888,700	668,534	

SESSIONAL PAPER No. 22

RECAPITULATION

OF the Yield and Value of the Fisheries of the Dominion, &c — *Concluded.*

Number.	Kinds of Fish.	Quantity.	Value.	Total.
			¢	\$
31	Dulse. Lb.	119,500		7,170
32	Fur seals skins in B. C. No.	13,798		331,152
33	Hair seals skins. "	16,427		16,791
34	Beluga or white whale skins. "	201		804
	Fish used as bait Brls.	303,948		455,921
	" " fertilizer. "	728,715		387,644
	Fish oil. Galls.	887,005		259,480
	Total for 1905.			29,479,562
	" 1904.			23,516,439
	Increase.			5,963,123

6-7 EDWARD VII., A. 1907

RECAPITU

SHOWING the whole production of the Fisheries in the

Number.	Kinds of Fish.	BRITISH COLUMBIA.		NOVA SCOTIA.		NEW
		Quantity.	Value.	Quantity.	Value.	Quantity.
			\$		\$	
1.	Cod, dried..... Cwt.			482,533	2,171,399	77,146
	" fresh or green..... Lb.	668,500	37,110	417,000	12,510	390,000
	" tongues and sounds..... Brls.			951	9,510	290
2.	Haddock, dried..... Cwt.			92,155	276,465	3,965
	" fresh..... Lb.			10,328,334	309,850	1,128,500
	" smoked (finnan haddies)..... "			2,632,350	157,941	63,900
3.	Hake, dried..... Cwt.			132,942	299,119	33,470
	" sounds..... Lb.			65,755	32,878	31,850
4.	Pollock..... Cwt.			138,935	277,870	22,581
5.	Tom cod or frost fish..... Lb.			315,400	13,497	2,010,200
6.	Halibut..... "	8,901,400	445,070	1,477,415	147,741	132,160
7.	Flounders..... "			806,674	29,380	538,100
	Salmon, preserved in cans..... "	56,005,456	6,621,942	6,755	1,013	4,300
	" fresh..... "	8,456,960	837,241	549,002	109,800	1,597,680
8.	" smoked..... "	446,000	44,600	11,730	2,346	7,500
	" pickled and dry salted..... "	16,538,600	826,930			
9.	Trout (all kinds)..... "	468,500	46,850	164,085	16,409	231,000
10.	Ouananiche..... "					
11.	White-fish..... "					8,600
12.	Smelts..... "	391,800	19,590	566,880	28,344	6,688,700
13.	Oulachons..... "	989,500	49,950			
	Herring, salted..... Brls.			77,940	350,730	176,120
14.	" fresh..... Lb.	4,495,500	224,775	5,055,240	50,552	2,923,000
	" smoked..... "	183,650	18,365	1,257,230	25,145	14,337,200
	" kippered..... "					368,800
15.	Sardines, preserved in..... Cans.					3,672,000
	" fresh or salted..... Brls.					336,496
16.	Shad..... "		750	1,070	10,700	4,851
17.	Alewives..... "			10,292	41,168	19,383
18.	Pike..... Lb.					
19.	Maskinongé..... "					
20.	Eels, salted..... Brls.			3,232	32,320	3,231
	" fresh..... Lb.					
21.	Perch..... "					
22.	Pickarel..... "					108,500
23.	Bass, achigan..... "					
	" striped or sea..... "			27,520	2,752	155,450
24.	Mackerel, salted..... Brls.			32,660	489,900	280
	" fresh..... Lb.			2,559,118	307,094	268,500
25.	Sturgeon..... "	20,000	2,000			9,650
	" caviare and bladders..... "					1,000
26.	Lobsters, preserved in cans..... "			4,917,148	1,229,287	2,249,440
	" alive or fresh..... Cwt.			134,961	1,119,467	18,520
27.	Oysters..... Brls.	1,027	7,190	1,466	7,330	14,300
28.	Clams, quahaugs, scollops, &c..... "		15,082	15,984	32,216	
29.	Squid..... "			22,274	89,096	857
30.	Coarse and mixed fish..... "			83,086	166,172	11,175
	" "..... Lb.	4,568,000	228,400		8,050	
31.	Fur seal skins in B. C..... No.	13,798	331,152			
32.	Hair seal skins..... "	5,684	3,363	193	241	116
33.	Fish, used as bait..... Brls.			81,726	122,589	103,203
34.	" used as fertilizer..... "		26,160	400,953	200,477	203,260
35.	Fish oil..... Galls.	184,390	13,696	259,091	77,727	58,382
Total.....			3,850,216		8,259,085	

SESSIONAL PAPER No. 22

LATION.

different Provinces of Canada for the year 1905.

BRUNSWICK.		QUEBEC.		ONTARIO.		P. E. ISLAND.		MANITOBA AND N. W. TERRITORIES.		Number.
Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
\$		\$		\$		\$		\$		
347,157	160,594	722,673				18,364	82,638		1	
15,600	401,100	16,044								
2,900	153	1,530				233	2,330			
11,895	2,972	8,916				696	2,088		2	
33,855	43,000	1,290				20,300	609			
3,834										
75,307	275	618				7,007	15,766		3	
15,925						16,100	8,050			
45,162										
60,306	211,600	6,348				5,000	150		4	
13,216	107,087	10,708								
16,143						2,000	60			
645									5	
319,536	1,072,447	211,994				19,000	3,800			
1,500										
	114,600	8,595							6	
23,100	238,843	23,884	7,060,050	617,085	21,400	2,140	105,000	6,300		
	11,000	1,100								
1,290	61,490	6,149	2,974,220	289,582			11,504,000	754,140	7	
334,435	231,950	11,597			783,620	39,181				
792,540	31,148	140,166	4,487	44,870	12,045	54,203			8	
29,230	1,446,500	14,465	4,334,800	216,740	694,000	6,940				
286,744	555,500	11,110			1,500	30				
36,880									9	
183,600										
672,992	7,260	21,780								
48,510		3,237							10	
77,532					735	2,940				
	158,960	7,948	1,479,990	59,196			4,699,000	159,920		
	7,270	727							11	
32,310	208	2,080			1,072	10,720				
	817,910	49,069	20,150	1,209						
	166,900	8,345	800,200	24,006			154,000	5,240	12	
7,595	168,885	16,624	3,236,940	323,694			7,452,500	437,075		
	46,200	4,620								
15,545	7,360	736							13	
4,200	5,072	76,080			2,397	35,955				
32,220	15,750	1,890			90,700	10,884				
772	116,595	6,996	401,350	32,108			931,000	93,100	14	
900			17,100	12,202			40,700	40,700		
562,360	1,148,412	287,103			2,182,624	545,656				
159,760	183	915			350	2,450			15	
71,500					17,656	88,280				
203,052	125	250				19,250				
3,428					115	460			16	
22,350					564	1,458				
	1,177,200	28,718	2,317,500	88,271			11,826,000	315,095		
									17	
145	† 10,434	13,042								
154,804	81,055	121,582			37,964	56,946				
101,630	112,812	56,406			2,970	2,970			18	
* 17,515	325,247	97,574			9,895	2,968				
4,847,090		2,003,716		1,708,963		998,922		1,811,570	35	

* Add \$7,170, value of Dulse in Charlotte Co.

† Add 201 belugas or white whale skins, \$804.

RECAPITULATION showing the Total Value of the Fisheries in the respective Provinces of Canada, from 1870 to 1905 inclusive, as compiled from the Annual Reports of the Department of Fisheries.

Year.	Nova Scotia.	New Brunswick.	Prince-Edward Island.	Quebec.	Ontario.	British Columbia.	Manitoba and Northwest Territories.	Total for Canada.
	\$	\$	\$	\$	\$	\$	\$	\$
1870.....	4,019,425	1,131,433	No data.	1,161,551	264,982	No data.	No data.	6,577,391
1871.....	5,101,030	1,185,633	"	1,093,612	193,524	"	"	7,573,199
1872.....	6,016,835	1,965,459	"	1,820,189	267,633	"	"	9,570,116
1873.....	6,577,085	2,285,662	207,595	1,391,564	293,091	"	"	10,754,397
1874.....	6,652,302	2,685,794	288,863	1,608,660	446,267	"	"	11,681,886
1875.....	5,573,851	2,427,654	298,927	1,596,759	453,194	"	"	10,350,385
1876.....	6,029,050	1,953,389	494,957	2,097,668	437,229	"	"	11,117,000
1877.....	5,927,858	2,133,287	763,036	2,560,147	438,223	104,697	"	12,005,934
1878.....	6,131,600	2,305,790	840,344	2,664,055	348,122	583,433	"	13,215,678
1879.....	5,752,937	2,554,722	1,402,301	2,820,355	367,153	925,767	"	13,529,254
1880.....	6,291,061	2,744,447	1,675,089	2,631,556	444,491	631,766	"	14,491,979
1881.....	6,214,782	2,930,904	1,955,290	2,751,962	509,903	713,335	"	15,817,162
1882.....	7,131,418	3,192,339	1,855,687	1,976,516	825,457	1,842,675	"	16,824,092
1883.....	7,689,374	3,185,674	1,272,468	2,138,997	1,027,033	1,644,646	"	16,958,192
1884.....	8,763,779	3,730,434	1,085,619	1,694,561	1,133,724	1,358,267	"	17,766,404
1885.....	8,283,922	4,005,431	1,293,430	1,719,460	1,342,692	1,078,638	"	17,722,973
1886.....	8,415,362	4,180,227	1,141,991	1,741,382	1,535,998	1,577,348	"	18,679,288
1887.....	8,379,782	3,350,507	1,037,426	1,773,507	1,531,850	1,974,887	"	18,386,103
1888.....	7,817,030	2,941,863	876,862	1,800,012	1,839,869	1,902,195	"	17,418,510
1889.....	6,346,722	3,067,039	886,430	1,876,194	1,963,123	3,348,067	"	17,655,256
1890.....	6,636,444	2,689,035	1,041,109	1,615,119	2,009,637	3,481,432	"	17,714,902
1891.....	7,011,300	3,571,050	1,288,733	2,008,678	1,806,389	3,008,755	"	18,977,878
1892.....	6,340,724	3,203,922	1,179,856	2,236,732	2,042,198	1,088,254	"	18,941,171
1893.....	6,407,279	3,746,121	1,133,368	2,218,905	2,044,930	4,443,963	"	20,686,661
1894.....	6,547,387	4,351,526	1,119,738	2,303,386	1,634,968	3,950,478	"	20,719,573
1895.....	6,213,131	4,403,158	976,836	1,867,920	1,584,473	4,401,354	"	20,199,338
1896.....	6,070,895	4,759,423	976,126	2,025,754	1,605,674	4,183,999	"	20,407,425
1897.....	8,090,346	3,434,135	954,919	1,737,011	1,289,822	6,138,805	"	22,783,546
1898.....	7,226,034	3,849,357	1,070,202	1,761,440	1,433,632	3,713,101	"	19,667,121
1899.....	7,347,604	4,119,891	1,043,645	1,933,134	1,590,447	5,214,074	"	21,891,706
1900.....	7,809,152	3,769,742	1,059,193	1,989,279	1,333,294	4,878,820	"	21,557,639
1901.....	7,989,548	4,193,264	1,050,623	2,174,459	1,428,078	7,942,771	"	25,737,153
1902.....	7,351,503	3,912,514	887,024	2,053,175	1,265,706	5,284,824	"	23,959,433
1903.....	7,841,602	4,186,800	1,099,510	2,211,792	1,535,144	4,748,365	"	23,101,878
1904.....	7,287,099	4,671,084	1,077,546	1,793,229	1,703,229	5,219,107	"	23,516,439
1905.....	8,250,085	4,847,090	998,922	2,003,716	1,708,963	9,890,216	"	29,479,562
Totals.	247,144,588	118,424,200	34,283,705	70,396,704	41,345,122	98,449,049	15,401,836	625,445,224

SESSIONAL PAPER No. 22

CAPITAL INVESTED IN THE FISHING INDUSTRY OF CANADA, FOR THE YEAR 1905.

Number of Persons Employed.

During the season of 1905, no less than 82,870 fishermen were engaged in the Canadian fisheries, exclusive of the thousands employed in the lobster packing industry.

While 9,366 sailors manned the 1,384 fishing crafts, no less than 73,500 fishermen used 41,463 boats for the same purpose. Altogether, nearly seven million fathoms of nets were used with many other fishing implements aggregating a capital of nearly thirteen million dollars, that is over half a million more than the previous outlay.

The lobster plant alone is estimated at \$1,426,300, comprising the equipment of 723 canneries, dispersed on the coast of the maritime provinces. Of these establishments, Nova Scotia operated 237, New Brunswick 198, Prince Edward Island 196 and Quebec 92. Besides the packing industry, the shipping of these crustaceans alive or fresh to the New England markets has developed large proportions. For those suitably located, the latter branch of the lobster industry is the more remunerative. Over 14,000 persons found profitable employment in these different establishments, which put on the market about 10½ million lb. of the preserved article, valued at \$2,624,400. Including the fresh lobsters, the whole output aggregates a value of \$3,907,000, the second of importance on the list of commercial value.

The salmon industry of British Columbia has, in 1905, surpassed any previous record of yield or value in that province. Over eighty million pounds of that fish were put on the market, prepared in different ways as commerce required. Over 17,250 persons found employment in that branch of the fishing industry. These fishermen used about 4,800 fishing boats with over 800,000 fathoms of gill-nets, together valued at over \$800,000.

Not including the sealing fleet, (which is still valued at \$393,600) the remaining capital invested in canning and other branches of the fisheries industry of this Pacific province is computed at \$2,764,545.

Only eighteen of the sealing fleet were hunting seals during the season of 1905. They were manned by 188 white men and 309 Indians. One vessel was lost at sea with its whole crew. The other vessels secured an average of 626 skins each. The skins realized \$24 each, an aggregate of \$331,150.

RECAPITULATION

Of the value of Fishing Vessels, boats, nets, etc., and of other fixtures in the fisheries of Canada, 1905.

PROVINCES.	FISHERMEN.		VESSELS.		BOATS.		NETS AND SEINES.		Value of traps and pound-nets, weirs, &c.	Value of lobster plant.	Approximate value of freezers, fisheries and other fixtures.	Total value.	
	Vessels.	Boats.	Number.	Tonnage.	Value.	Number.	Value.	Fathoms.					
Nova Scotia.....	5,658	19,704	632	24,369	1,207,517	15,906	379,305	1,838,105	697,000	277,428	645,317	1,155,330	4,361,897
British Columbia.....	{ 451 +518	17,251	{ 88 +37	{ 2,288 2,516	{ 389,492 393,600	4,793	305,780	806,643	524,598	382,825	.....	1,161,850	3,158,145
New Brunswick.....	1,336	12,937	348	5,643	167,300	7,600	258,570	896,390	453,350	371,828	357,371	573,640	2,182,059
Quebec.....	181	13,186	36	1,434	31,560	7,351	227,023	332,774	193,944	250,000	140,370	295,918	1,138,875
Ontario.....	652	2,533	*122	2,195	325,675	1,464	120,898	1,978,342	247,973	166,024	.....	100,130	960,700
Prince Edward Island...	113	3,324	25	490	13,050	1,940	46,656	93,900	36,948	17,752	283,245	20,300	417,951
Manitoba, Saskatchewan and Alberta.....	457	4,570	*96	2,795	285,640	2,409	35,105	982,080	156,695	9,120	.....	174,710	661,270
Totals.....	9,366	73,505	1,381	41,640	2,813,834	41,463	1,373,337	6,928,234	2,310,508	1,475,037	1,426,303	3,481,878	12,886,897
Grand total.....	.....	82,871	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

† Seal hunters. ‡ Sealing fleet. * Mostly tugs.

SESSIONAL PAPER No. 22

RECAPITULATION.
STATEMENT of the Lobster industry in Canada during the season of 1905.

Provinces.	Number of persons employed in Canneries.	Plant.				Catch.					
		Number of Canneries.	Value.	Number of Traps.	Value.	Total value of Plant.	Number of Cans.	Value.	Fresh or Alive.	Value.	Total value of whole catch.
			\$			\$	lbs.	\$	Cwt.	\$	\$
Nova Scotia	5,420	237	193,010	591,770	452,307	645,317	4,917,148	1,229,287	134,961	1,119,467	2,348,754
New Brunswick.....	5,133	198	110,600	269,275	246,771	357,371	2,249,440	562,360	18,520	159,760	722,120
Prince Edward Island.....	2,083	196	102,235	283,960	181,010	283,245	2,182,624	545,656	350	2,450	548,106
Quebec.....	1,401	92	72,805	94,645	67,565	140,370	1,148,412	287,103	183	915	288,018
Totals	14,037	723	478,650	1,239,650	947,653	1,426,303	10,437,624	2,624,406	154,014	1,282,592	3,906,998

6-7 EDWARD VII., A. 1907

COMPARATIVE TABLE showing Number, Tonnage and Value of Vessels and Boats engaged in the Fisheries of Canada, together with the Value of Fishing Materials employed, from 1880 to 1905.

Year.	VESSELS.			BOATS.		Value of Nets and Seines.	Value of other Fishing Material.	Total of Capital Invested.
	No.	Tonnage.	Value.	No.	Value.			
			\$		\$	\$	\$	\$
1880.	1,181	45,323	1,814,688	25,266	716,352	985,978	419,564	3,936,582
1881.	1,120	48,389	1,765,870	26,108	696,710	970,617	679,852	4,113,049
1882.	1,140	42,845	1,749,717	26,747	833,137	1,351,193	823,938	4,757,985
1883.	1,198	48,106	2,023,045	25,825	733,186	1,243,366	1,070,930	5,120,527
1884.	1,182	42,747	1,866,711	24,287	741,727	1,191,579	1,224,646	5,014,663
1885.	1,177	48,728	2,021,633	28,472	852,257	1,219,284	2,604,285	6,697,459
886.	1,133	44,605	1,890,411	28,187	850,545	1,263,152	2,720,187	6,814,295
887.	1,168	44,845	1,989,840	28,092	875,316	1,499,328	2,384,356	6,748,840
888.	1,137	33,247	2,017,558	27,384	859,953	1,594,992	2,390,502	6,863,005
889.	1,100	44,936	2,064,918	29,555	965,010	1,591,085	2,149,138	6,770,151
890.	1,069	43,084	2,152,790	29,803	924,346	1,695,358	2,600,147	7,372,641
1891.	1,027	39,377	2,125,355	30,438	1,007,815	1,644,892	2,598,124	7,376,186
1892.	988	37,205	2,112,875	30,513	1,041,972	1,475,043	3,017,945	7,647,835
1893.	1,104	40,096	2,246,373	31,508	955,109	1,637,707	3,174,404	8,681,557
1894.	1,178	41,768	2,409,029	34,102	1,009,189	1,921,352	4,099,546	9,439,116
1895.	1,121	37,829	2,318,290	34,268	1,014,057	1,713,190	4,208,311	9,253,848
1896.	1,217	42,447	2,041,130	35,398	1,110,920	2,146,934	4,527,267	9,826,251
1897.	1,184	40,679	1,701,239	37,693	1,128,682	1,955,304	4,585,569	9,370,794
1898.	1,154	38,011	1,707,180	38,675	1,136,943	2,075,928	4,940,046	9,860,097
1899.	1,178	38,508	1,716,973	38,538	1,195,856	2,162,876	5,074,135	10,149,840
1900.	1,212	41,307	1,940,329	38,930	1,248,171	2,405,860	5,395,765	10,990,125
1901.	1,231	40,358	2,417,680	38,186	1,212,297	2,312,187	5,549,136	11,491,300
1902.	1,296	49,888	2,620,661	41,667	1,199,598	2,103,621	5,382,079	11,305,959
1903.	1,343	42,712	2,755,150	40,943	1,338,003	2,305,444	5,842,857	12,241,454
1904.	1,316	43,025	2,592,527	41,938	1,376,165	2,189,666	6,198,584	12,356,942
1905.	1,384	41,640	2,813,834	41,463	1,373,337	2,310,503	6,383,218	12,880,897

SESSIONAL PAPER No. 22

COMPARATIVE TABLE showing the number of men employed in the Fishing Industry since 1880.

Year.	Number of Persons in Lobster Canneries.	Number of Men in Vessels.	Number of Men in Boats.	Total Number of Fishermen.	Total Number of Persons in Fishing Industry.
1880.....		8,757	51,900	60,657	
1881.....		8,359	50,679	59,056	
1882.....		8,498	52,785	61,283	
1883.....		9,966	52,259	62,225	
1884.....		9,968	51,854	61,822	
1885.....		9,539	53,282	62,821	
1886.....		8,927	53,073	62,000	
1887.....		8,911	55,247	64,158	
1888.....		9,574	53,109	62,683	
1889.....		9,621	55,382	65,003	
1890.....		8,726	55,000	63,726	
1891.....		8,666	56,909	65,575	
1892.....		8,330	55,348	63,678	
1893.....		8,899	58,854	67,753	
1894.....		9,525	61,194	70,719	
1895.....	13,030	9,804	61,530	71,334	84,364
1896.....	14,175	9,735	65,502	75,237	89,412
1897.....	15,165	8,879	70,080	78,959	94,124
1898.....	16,548	8,657	72,877	81,534	98,082
1899.....	18,708	8,970	70,893	79,893	98,601
1900.....	18,205	9,205	71,859	81,064	99,269
1901.....	15,315	9,148	69,142	78,290	93,605
1902.....	13,563	9,123	68,678	77,801	91,364
1903.....	14,018	9,304	69,830	79,134	93,152
1904.....	13,981	9,236	68,109	77,345	91,326
1905.....	14,037	9,366	73,505	82,871	96,908

FISHING SEASON OF 1906.

PRELIMINARY REPORTS OF THE INSPECTORS OF FISHERIES IN THEIR RESPECTIVE DISTRICTS.

GENERAL REMARKS.

As the fishery statistics published every year are always a few months old, it has been customary to request all our inspectors of fisheries to briefly summarize the prospects of the current fishing operations as well. This year, owing to an early session of parliament and consequent early preparation of our report, the usual request comes to them three months before the end of the season, hence their data cannot be expected to be as reliable as formerly. However, a glance at the following reports from the different parts of the Dominion will give interested parties a fair idea of coming results.

From a point of view of establishing comparisons, it is almost regrettable that the total value of the 1905 fisheries, just published, soared so high above all previous records, as no doubt, it will be years again before such an aggregate is reached permanently. (*Nearly thirty million dollars*).

While to the phenomenal pack of sockeye salmon was due the enormous surplus of last year, to the shortage of the same British Columbia industry may be ascribed the large decrease in perspective for the current season.

The other branches of the fishing industry there, will be as good, in fact, halibut is reported even better than in 1905. The same may be said of the herring business which is extending in different branches.

The whaling station in Barclay Sound will prove a successful venture.

In the maritime provinces one fluctuation will make up for another, and the general result will be as satisfactory as in 1905. Salmon seem to have been plentiful almost on every part of the coast. The yield of the cod family will also generally prove as productive as the previous one. Prices for this staple article continued to be remunerative, much above the rates adopted for our statistical statements. The lobster industry will fall short of 1905, especially in Cape Breton, but in the Northumberland straits the packing will be as large as ever. Herring, especially for sardine purposes, was almost a failure in the Bay of Fundy. This will make a big contrast coming after the large catch of last year.

Dogfish has not yet abandoned its usual summer resorts, although they were less numerous than in former seasons.

The above remarks in the maritime provinces might embrace the gulf division of Quebec, where nearly all kinds of fishing are reported fairly satisfactory, excepting perhaps the lobster industry. Salmon and cod were abundant, some of the latter were reported caught as far up as Rimouski, quite an unusual event.

SESSIONAL PAPER No. 22

It is hoped that the inland western waters east of the rockies will at least maintain an equal production to that of the past few years. As civilization advances in the west there is more demand for fish food. With proper protection and due limitation to real domestic fishing, these waters might supply such food for years to come. With increased means of transportation, the temptation for commercial ventures will exist in fishing as in other pursuits.

NOVA SCOTIA.

Inspector A. C. Bertram, of Cape Breton, says that while some of the commercial branches have been exceptionally poor, others will yield an average, and that of salmon more than the previous one.

Taking the whole industry, the result of this year's operations will be a considerable decrease in the total value.

The lobster fishery, the first branch of the fishery prosecuted in the season, and an important one, not only to fishermen, but to others employed in canneries, was a failure this summer. The spring herring fishery, an important fishery also, as spring herring are used largely for bait by not only local fishermen, but foreigners as well, was below the average.

The cod fishery gave good results early in the season, but after the arrival of dog-fish early in July and scarcity of bait, this branch of the fishery became so discouraging to fishermen that hundreds of young men abandoned fishing and left their homes for either Western Canada, the coal mining districts of Cape Breton, or the Maine (U.S.) woods.

The salmon fishery was unusually good, particularly in the Northern waters of the county of Inverness. Besides exceptionally good salmon net fishing, the principal rivers became well supplied, and in the famous Margaree, anglers have done better than in any of the past twenty years.

Fishermen are preparing to vigorously prosecute the fall mackerel fishery, and more especially the fishermen of Inverness County. About the third week of September, mackerel appeared in large numbers, and some boats have already done well. Last fall the mackerel schools passed from the north bay southward on the northern part of the island through the Strait of Canso, instead of as formerly on the eastern side of the island. The result was immense catches by the fishermen of Inverness, and a poor mackerel fishery by the fishermen on the south eastern side of the island.

Although the fishery for this year has not been good, there will be little or no distress during the coming winter, on account of the excellent crops of this year.

Inspector R. Hockin of District No. 2, N.S., reports as follows:—From the reports received from the local officers it is estimated that the total yield will fall short of that of last year—about fifteen per cent.

The returns from the cod, haddock, hake and pollock fisheries are expected to be considerably short of last year.

6-7 EDWARD VII., A. 1907

The yield of the halibut fishery will be nearly the same, and the same may be said of the mackerel.

The herring, however, have been in abundance, and more have been taken than for several years.

The lobster fishery will yield about 10 per cent short of last year, partly owing to boisterous weather on the Atlantic coast during the fishery season.

Salmon will show a larger catch than for many years.

More shad have been taken this year than for a number of years.

The gaspereau fishery on the Atlantic coast has been almost a total failure. In the Bay of Fundy some have been taken but much less than the average.

The dogfish were not in abundance at the first of the season, but lately have been numerous and are seriously retarding the efforts of the fishermen.

NEW BRUNSWICK.

Inspector J. H. Pratt, N.B., says :—The catch of herring has not been so small for a great many years, more especially the smaller size for sardine purposes. On account of this unusual scarcity, and the sardine market being glutted with the manufactured article from last season's pack, the prices received by our weir owners never exceeded \$4 per hoghead and in many cases, much less. Large herring do not come early in the season as a rule, but there are good signs of this fish striking in shore soon and there is a clear market awaiting them with good prices.

Dogfish have been as destructive as in past seasons, causing the usual heavy loss to the fishermen's gear, but, in the past few weeks they are reported as decreasing in numbers.

Cod and haddock will show fully their usual catch with probably an increase on account of so many disappointed weir fishermen having been compelled to resume hand-lining for a living. Pollock fishing has been up to the average, especially the Quoddy river fishery, which compensated the fishermen to a large extent for the decreased sardine fishery.

Several of the weirs at Campobello made large catches of pollock besides their usual herring catch, causing the envy of those who make their hauls by the more laborious process of the hand lines.

The catch of salmon in the Bay of Fundy was an extremely good one, fully equal to that of 1905.

Dynamiting among the pollock schools has been practiced very largely all summer by the fishermen of Eastport, Maine, and on numerous occasions they came over among the pollock schools in Canadian waters with their explosives.

The lobster catch will show about the same as last season, with prices good. The same number of factories were in operation, and their pack was about the same as that of 1905.

SESSIONAL PAPER No. 22

Inspector R. A. Chapman, of N. B., says :—More shads have been caught than for past few years.

Salmon have been more plentiful in the aggregate than for several seasons past, and they are yet seen by our guardians in great numbers on all the streams which bespeaks for another large catch next year.

Spring herring were as plentiful as ever and the fall run on the Caraquet Miscou banks of unusually fine fat fish is now reported.

The catch of codfish will be considerably larger than that of last year notwithstanding a great scarcity of bait.

Fully as many smelts were caught as in previous year and they were of very much better quality.

Considerably more mackerel were taken this year than last.

It is too early yet to say much about oysters.

While somewhat less lobsters were canned in the northern part of the district than in 1905, on our side of the straits, in Westmorland and Kent counties, more have been taken than for many years. In fact, the catch was so large during last three weeks of fishing that much difficulty was found in getting help to pack them, many of the packers and fishermen in the northern part of the province propose to fish only in the spring and fall, and allow no fishing during the summer months when they are spawning. If something of this kind could be done, I do not believe they ever could be fished out.

The whole aggregate catch of fish will be considerably above that of 1905, and prices being high will make it an exceptionally good year for the fishermen.

Inspector H. E. Harrison, of Fredericton, says :—The inland fisheries of New Brunswick, taken collectively, have not given as good returns as previously. It is difficult to give any explanations for these conditions, other than it seems to be an 'off year' with most of the fish caught for market, particularly salmon. It is still harder to explain these conditions, regarding the upper part of the St. John and tributaries when salmon have been plentiful in the harbour and adjacent waters. The early spring reports were favourable to salmon fishermen but it did not last long, and with few exceptions, those following that particular line, the returns were not satisfactory. Not only was this the case with net fishermen but angling was very much below the average on the Tobique river where most of the fly fishing of my district is carried on. It is reported that there is now a good run of salmon in York County waters.

The quantity of shad taken this season was considerably below that of 1905. There is a possibility that this fishery is being carried on too extensively for the future good supply of this most valuable fish. Like conditions prevailed regarding alewives, but while it is possible that shad are being over-fished I do not think this is the case with alewives. However, it would be premature to form a decided opinion on one or even two years' results. These fish were in large demand and I think fishermen were fully compensated.

I look for an enlarged catch of sturgeon again this season. I am decidedly of the opinion that greater restrictions are necessary, if total depletion of these valuable fish is not the result in the very near future.

6-7 EDWARD VII., A. 1907

Trout fishing is reported extra good in some parts of the district and only fair in others.

P. E. ISLAND.

Inspector J. A. Matheson of P. E. I. says :—The lobster fisheries show a small increase over last year, notwithstanding that the stormy weather particularly, on the north side of the island, interfered a good deal with that section.

Cod fishery commenced well in the early part of the season but fell off later, and will show a decrease from 1905.

Hake has been plentiful particularly in King's county and continued well up to the first of September, when the dogfish appeared in great swarms on our coast, and destroyed this fishing. The outlook for fall fishing is not very bright, this fishing will show an increase over last year.

Mackerel will show a slight increase over last year. The season opened with a large run of this fish and was then followed by some of smaller size during the season.

Smelts show a decrease from last year.

The quahaug industry has assumed large proportions in this province, and if properly protected will certainly be one of the best paying of our fisheries, and already this season, fifty thousand dollars worth were shipped from the province to the United States.

PROVINCE OF QUEBEC.

Dr. W. Wakeham.—Officer in charge of the Gulf division, reports that the final returns of the fisheries of the district will show a considerable increase over those of the two preceding years, all branches of fishery, with the exception of the Lobster fishery, having made good yields.

The season began early, the first fishery to open, that of the spring herring, was as abundant as ever at the Magdalen islands, part of the main school passed south of the islands, and struck the shore of Etang du Nord, so that there was, perhaps, not as large a catch as usual in Pléasant bay.

Summer herring, as has been the case for some seasons back, kept off shore in deep water. Small herring fish about five inches long, were abundant all about the coast, but the nets in general use had too large a mesh to capture them.

Cod were abundant all season, and the summer catch on the south shore has been good, at the time of writing the fall fishing is on, and the reports are every where favourable for a good fishing, as both cod, and bait are abundant, unfortunately for the fishery, many of the boats are ashore for the winter, and that one half the fishermen have left for the lumber camps. In spite of this the yield from the south coast fishing stations will be a good one. On the lower north coast, from Natashquan to Belle Isle, the fishing was a failure, as except at a few points, the Capelin school of cod kept off shore in June and July, on the upper north shore from Natashquan West, the fishery will be an average one.

SESSIONAL PAPER No. 22

The catch of salmon, both on the north and south shores, has been an abundant one, the best for many years.

The lobster pack will show a serious falling off, the returns are not all in, as lobster fishing is still going on at the Magdalen islands, but I do not expect that the final summing up of the statistics will give more than about two thirds of an average pack.

The spring *mackerel* fishing at the Magdalen islands was good. The fall fishery is still being made. A very abundant seal hunt was made at the Magdalen islands in March and April, the seals were driven in on the shore, and all hands, men, women and children participated in the hunt.

Dogfish were as usual of recent years, the cause of great annoyance and loss. They are now possibly out of the gulf.

The season was a fine one, very warm, and without storms.

Inspector Jos. Riendeau, of Montreal, says :—The yield of fish, in my district, this year will be inferior to last year's catch, by one-half. This is due to several causes. First, the effects of latter years' abuses begin to be felt. The big fish are gone ; only the new generation is left. This must be protected, if we want to avoid a complete ruin. I would mention, as an example, sturgeon three or four feet long, which were abundant eight or ten years ago. This was a valuable fish ; it is now replaced by small sturgeons, measuring from 12 to 15 inches. I have even seen some on the market only seven inches in length.

I may state the same thing about '*barbottes*' (bullheads). This fish is also *recherché*. We used to catch some of a remarkable size and supplied the New York markets with them. Those we catch to-day are only fry, as compared with the old time '*barbottes*'.

This may be said of all kinds of fish, frequenting our lakes and rivers.

Another cause for this decrease is the following : During spring time, when the water is high, the bays become larger, and the small rivers and rivulets rise ; that is the time fish choose for spawning, and they enter the bays or come up the rivers to deposit their eggs. Then inconsiderate fishermen lay their nets, or build dams, which destroy thousands of fish. In my opinion, severe laws should deal with such actions. This custom is followed especially in small bays south and north of Lake St. Pierre.

A third cause for this falling off is the number of licenses granted by the province of Quebec. It is too large, especially on the south shore, from Nicolet to Sorel islands, and from Champlain to Pointe du Lac, on both shores ; fishing tackle is seen everywhere, some of which extend from 200 to 500 yards. How can small fish be expected to escape such formidable tackle ? This seems impossible.

It is also regrettable that trout should constantly decrease, as it is a most exquisite and valuable fish. I think that this is due to the fact that the fishing season for trout is too long. Nobody should be allowed to fish trout *before June 15th or after September 1st*. Fishermen fishing for their own use, should throw back into the water every trout

which would not be of the length stipulated in the regulations. This fish should not be made a commercial one; I am speaking of speckled trout.

I also consider it my duty to protest against the use of small seines "à véron" or with minnows. This causes a large decrease in the catch of maskinongé, black bass, doré and trout. The results, this year, have been even worse than those of last year, which were not altogether very good.

*Inspector A. H. Belliveau, of Ottawa, says:—*That in most of the inland districts of the province of Quebec, fishing results will still be inferior to the small yield of 1905. Not only the fish are falling off in size, but the better grades, as maskinongé, bass and pickerel, are gradually disappearing from their former haunts. This diminution may be safely ascribed to indiscriminate netting in the past as well as to the prevalence of the small meshed implements.

Missisquoi bay held its own better than any other fishing ground in my district. Although the time allowed to fish is very limited, fishermen realized as much as in previous years. New York regulations somewhat hampered them, but other markets were soon found. The interested parties then contracted for their whole catch at a stated rate instead of risking the chances of a fluctuating market.

The few week's seining allowed there in the spring cannot be so injurious as claimed by the petitioners for the prohibition of all netting as fish seems yet far from being depleted. The whole catch consists more of coarse fish than doré.

In Richelieu river, fishing was not as good as formerly, and hoop-net fishing did not pay so well. No seines at all were tolerated in that district this summer. The great Iberville eel-weir was again successfully operated, and even if Fulton market is closed to their owners, others as remunerative have been opened in the west.

In the Saguenay district, salmon was abundant and poachers were very active making a home provision and even selling a few to summer hotels.

In nearly all other parts of my extensive district, the fisheries will show a considerable decline.

To save complete depletion, some of the waters should be set apart, for a few years, for the natural propagation of fish, and other restrictions, as regulation of mesh, and a minimum size of all species of fish, it is advisable to protect, should be adopted without delay.

It is to be hoped that whatever is the result of the deliberations of the interprovincial conference, the fisheries will receive due consideration, and that the administration of its regulations will be simplified and improved instead of the confusion existing for the past years.

ONTARIO.

*Inspector J. M. Hurly, of Belleville, says:—*During the spring fishing season at which time the coarser species of fish are captured, good returns were realized by the

SESSIONAL PAPER No. 22

fishermen. The fishing for whitefish and herring was exceptionally good during the past season, in fact, it is reported to me as being the most successful for many years.

In travelling over my district I find that angling has been very good and many Lakes and streams are showing good results from the stocking of young fish which goes on from year to year from the Fish Breeding Establishments.

The improved fishing in adjacent waters is no doubt largely responsible for the increase in the number of tourists visiting this section of the Dominion which means large expenditures of money benefiting all classes.

The bass ponds on the Bay of Quinté are doing good work, a large number of bass measuring on an average 3 inches in length being distributed each year.

I am sorry to say that carp, especially German carp appear to be on the increase, notwithstanding the fact that immense quantities are captured in hoop-nets each season. The question of some action being taken towards clearing the waters of these pests is becoming more urgent each year and the time is not far distant when very serious consideration will be necessary.

Inspector O. K. Shepperd, of Ontario, reports that as far as he can judge from his visits to the various fishing districts, the commercial fishing in his division has not been up to the average and not as good as last season, which was a very bad one. This applies especially to the Lake Erie district where the catch has so far been exceptionally light. The rod and line fishing shows a slight improvement over last season, especially in the Georgian bay district and in the inland waters. The law is being fairly observed but to my mind too great a number of netting licenses of all kinds are being issued, and unless this number is lessened, nothing can be looked for but a gradual diminution of our fisheries.

The carp are doing incalculable damage both in the international waters and in the inland waters where they have gained a foothold; as well as injuring the fisheries, they are destroying the wild rice which is the natural food of the wild duck.

Inspector A. G. Duncan, of Marksville, Ont., says:—As previously reported, the whitefish, salmon trout and sturgeon are gradually on the decrease and the catch of these species will not be equal to that of 1905.

The fishery officers under the control of the provincial government have been fairly diligent in attending to their duties, but as they are not provided with the means of a proper enforcement of the fishery laws there is no doubt but that the number of nets fished is in excess of the number allowed by licenses and for the same reason there is considerable poaching done by American vessels in my division.

It is an impossibility to enforce the fishery regulations unless the officers are provided with steam power to enable them to overhaul the tugs used alike by the Canadian and American fishermen.

MANITOBA.

Inspector Wm. S. Young, of Manitoba, reports an average fishing season.

The catch of whitefish will not show much of an increase or a decrease. Sturgeon will show a slight falling off, while pickerel, pike and tullibees will show a slight improvement.

6-7 EDWARD VII., A. 1907

However, the prices of fish received by the fishermen were just twice those of 1905. All fishing closed down the first day of September this year, instead of the 5th day of October as in previous years, so that when one considers that with a full month cut off the whitefish season, that the yield will be equal to that of the previous years. I think we will be able to congratulate ourselves on this achievement.

SASKATCHEWAN.

Inspector of Fisheries W. E. Miller, of Qu'Appelle, reports as follows :—This year will show an increased yield over that of 1905. The winter was very mild and allowed of ice fishing being pursued under very favourable circumstances. Heavy rains in June prevented the excessive lowering of the streams and lakes which had been looked for owing to the limited snowfall. Intense heat prevailed in July and August and some loss of fish was reported in the shallower lakes of southern Saskatchewan. Many more net licenses have been taken out by settlers wishing to fish on a small scale for their own use, and the amount of angling done again shows a large increase. The main winter export fishery was carried on at Moose lake where operations were very successful in the aggregate, though individual catches ruled smaller. In the Prince Albert district, a good winter catch was made at the Trout lakes leading to a renewal of the export trade which promises to grow considerably this coming season. At Cumberland the sturgeon fishing has not been so actively pursued this summer, but that fishery has been vigorously pressed in Cedar lake on account of its greater ease of access. Owing to increased local demand there is more fishing being done in the Battleford district and a considerable increase is expected there this coming winter.

ALBERTA.

Harrison S. Young, of Alberta, reports, that all creeks were very low when the ice went out in spring, many were almost dry, and they did not rise until after the June rains. Settlers put in dams to hold water for stock, and at many of these dams, fish were killed illegally. The guardians broke up many of these structures. There is but little commercial fishing in this district during summer. A few fishermen at Lac Ste. Anne, White Whale lake and Pigeon lake, supply the local trade in Edmonton and towns along the Calgary and Edmonton railway, but no fish are shipped outside the district. From all lakes the yield of white and other fish is reported good.

The guardian at Beaver lake, reports that a sturgeon was killed in that lake this summer, having found its way up the Beaver creek from the Saskatchewan. Sturgeon were formerly captured in considerable numbers at Victoria and Edmonton by spear and gaff, during the time they were passing up stream to spawn, when they take advantage of the eddies and slack water along shore. Since the fishery regulations have been enforced, the practice has stopped, and a sturgeon is seldom seen in Edmonton, an occasional one only being caught with a night line.

From reports I have received, I am afraid that there is great destruction of trout in the streams of southern Alberta, where the fishery regulations are not very well enforced. Dynamite is said to be used, I have reported fully on this matter. Reports may and probably are exaggerated, but I think there is no doubt that guardians should

SESSIONAL PAPER No. 22

be appointed to enforce the regulations, and prevent the destruction of trout that is now carried on. The Canadian Northern Railway will have steel laid on their line to White Whale lake this fall. This will allow of summer fishing in these lakes, and care will have to be taken that they are not overfished.

The fisheries of the district are all likely to yield as good returns as in former years. If accurate returns could be had of the amount of coarse fish killed, the value of the fisheries of the district would show a large increase. I cannot see, however, how at present, more accurate returns can be had.

The demand from settlers for fish with which to stock lakes where there are no fish, and from others to have bass or other game fish with which to stock waters where at present there are only suckers and pike, still continues, and the need of a hatchery somewhere in the west would seem to be more apparent every year.

BRITISH COLUMBIA.

Inspector C. B. Sword, of New Westminster, B.C.; says :—The sockeye salmon fishing may be considered practically closed, but it is quite impossible to give any estimate of what quantity of cohoes and other fall fish may be packed as this fishing is just beginning. The sockeye pack for this district has been very light about 178,500 cases, to which should be added about 7,000 cases packed in Victoria (district No. 3).

On Puget sound the same state of affairs was experienced 150,000 or 160,000 cases will cover the pack.

There has been a good run of spring salmon which, however, has been mainly shipped as mild cured or in cold storage.

Halibut, which (though properly belonging to district No. 2) is next in importance to the salmon fishing, will I expect show an increase of from 20 to 25 per cent over last year.

With the exception of these two varieties, I do not think that our returns will show very much change from last year, though I anticipate a moderate increase in all branches except of course the sockeye pack.

Jno. T. William, inspector of fisheries, says :—That in district No. 2, Northern British Columbia, he is not in a position to give even approximate figures and data, at this early date, as the season is not yet completed, and he can therefore only in a general way express his opinion on the fishery prospects. He says : commencing at the southern portion of my district, the sockeye salmon yield on *Smiths Inlet* has been most satisfactory, the canneries there have secured a full pack, and a large number of sockeye have reached their spawning grounds in the lakes at the head of this inlet.

Rivers Inlet has again supplied a full pack of sockeye salmon for the seven canneries in operation. Large quantities have also reached their spawning grounds on *Oweekayno* lake.

Northern Coast Canneries *Namu*, *Kimsquit*, *Bella Coola* and *Lowe inlet*, have also done well, the sockeye salmon catch having proved most satisfactory to the cannery-men, particularly at *Namu* and *Kimsquit*.

6-7 EDWARD VII., A. 1907

It was my intention to visit the head waters of the Bella Coola and Kimsquit rivers this fall, but owing to other important engagements, I have been obliged to abandon the visit until the spring of 1907.

The Skeena river has again proved a sad disappointment to the cannerymen, who have only succeeded in securing a half pack of sockeye, reaching about a two thirds pack including fall fish.

I consider this is owing to the barricading of the streams and rivers at the head waters by the Indians, and unless this is stopped, the Skeena river will gradually deteriorate. Owing to the Indians having erected barricades on Babine river this season, very few sockeye have reached the spawning grounds, consequently four years from this season we may expect an exceedingly poor run, of this valuable fish.

The Naas River canneries have done fairly well, securing about a two third's pack of sockeye salmon, one or two of the canneries nearly filling up on fall fish. With regard to the other fisheries in my district, I cannot give even an approximate opinion, though I understand the halibut and oulachon catches have been good.

Inspector Edward G. Taylor, of Vancouver, B. C., report as follows :—

During the past year the fisheries of my district (Division No. 3) have from one point of view been most satisfactory ; but in another aspect the season has not been as satisfactory as was anticipated.

The new whaling enterprise carried on in Barklay sound has been a marked success, and has rapidly developed into an extensive industry. Indeed for many weeks during the past year there was an average capture of no less than three whales daily. Occasionally captures of the valuable Sperm-whale added to the remarkably remunerative results of the whale fishery on Vancouver island.

The salmon fishery has brought excellent returns to the fishermen owing to the high price prevailing, and the large takes of spring salmon now in great demand. Some of the salmon trap owners have suffered a disappointment as the sockeye run was limited ; but many of the traps were compensated by the very fine catches of spring salmon and cohoes. The former being largely bought for 'mild curing' purposes—the latter for cold storage, for fresh fish trade in the Northwest Provinces.

The herring fishing was again pursued on an extensive scale, and has grown to be quite a leading industry. Nanaimo of course, being the chief centre. The catches of herring are cured in Nanaimo as kippers, bloaters and pickled as well as salted, and frozen for bait.

The demand for bait is very large for the halibut fishery ; quantities being exported to Washington State for that purpose, while steamers call at Nanaimo for supplies of herring bait on their way to the northern halibut banks.

There is a good opening for a crab-fishery as the crabs are of large size and extremely abundant. It is a growing industry, and during the past season quite considerable quantities were taken in my district.

SESSIONAL PAPER No. 22

Many localities in my district are famous for sport fishing, attracting anglers more and more every year as the spring salmon and cohoes afford fine troll and fly fishing. The Cowichan river, Campbell river, Englishman's river, Alberni canal and others have a wide reputation.

The much esteemed Olympian oyster abounds in quite a number of places in my district, and some of the beds as at Blunden harbour and Barklay sound are of very large extent. The demand, however, is so large that many oyster areas already show signs of depletion.

The Olympian oyster is of small size, often less than one fifth of the size of an average Atlantic oyster. The department has on several occasions carried out a scheme for introducing and planting the large Atlantic oyster; but hitherto they do not appear to have bred or increased. For the first time in British Columbia the eastern oyster, I am pleased to report, has produced spat, and I have obtained 'Seed' oysters probably a year old at points where the eastern oysters was planted last year.

During the month of July a Committee of the British Columbia Fishery Commission made a tour of the west coast of Vancouver island, and expressed their astonishment at the amazing fishery resources of the island, from Sooke to Quatsino sound. The party consisted of Richard Hall, M.P.P., and Mr. J. C. Brown, accompanied by myself were conveyed on the C. G. S. *Quadra* and received much valuable aid in their investigations from Captain Hacket.

During the herring season I was greatly assisted by the C. G. S. *Falcon* she proved very efficient in her patrol of the herring grounds.

It is necessary, however, for the proper patrol of the waters between the island and the mainland to have the services of a boat all the year round.

BAIT FREEZERS.

The aid to the sea fishermen offered and extended by the department in the direction of cold storage for bait, so as to ensure a supply of this essential article at times when there are no bait fishes on the coast, and bait cannot be otherwise procured, was begun as a departmental work in 1899, and in the year 1900 the first fishermen's bait freezer was established at Ballantyne's Cove, county Antigonish, Nova Scotia. The system was summarized in the departmental report for 1900 at page ix.

The success which attended the initial efforts as demonstrated by the local small 'fishermen's bait freezers' with a capacity ranging from 15 to 40 tons of frozen bait, according to the requirements of the localities, and designed to meet the immediate needs of the shore boat fishermen, during the periods of the dearth of bait, without which they could not carry on their fishing operations, attracted attention to the interests of the deep-sea bank fishing vessels, with a view to extending to that important branch of the fishery similar aid and conveniences.

The operations of the Nova Scotia fishing fleet was greatly hampered by a lack of this most elementary essential to a successful fishing venture; that is, an unfailing supply of good fresh bait; resulting in a desultory exploitation of the fishery rather than a concerted and remunerative one.

6-7 EDWARD VII., A. 1907

Believing that an impetus would be given to the business in which most of the fishing vessels were tied up for more than half of the year, the department undertook to extend the experiment to a practical effort to do for the bank fishermen that which the small bait freezer was doing for the shore fishermen.

For this experiment two points on the Nova Scotia coast were selected in turn; one at Canso, and another at Halifax, where large bait cold storage establishments were inaugurated with government aid under special conditions.

The latter establishment was intended more particularly to meet the needs of a large fishing fleet in Halifax and neighbouring counties, which was unable to avail itself of the winter fishing because and only because of the fact that it was impossible to rely on even a partial bait supply, but with this disability removed, it was confidently expected that the incentive would revolutionize the winter fishing operations in the western portion of the sea-coast of Nova Scotia.

The Canso establishment, the first inaugurated, was regarded as being of more general scope, for the supplying of vessels from all localities, visiting the banks of the Gulf of St. Lawrence as well as those of the Atlantic coast.

The departmental report—Fisheries—for the year 1905, contains full descriptions of these two extensive bait cold storage plants and their processes as distinctive in type, importance, cost and principle from the small shore 'Fishermen's Bait Freezers', which range in cost from about \$1,000 to about \$4,500, according to relative importance and demands of localities.

The Canso establishment sold to United States and Canadian fishing vessels this season up to date, 271,823 pounds of frozen bait, of which 1,554 pounds were herring, the remainder being squid. The price received for the squid was 3 to 3½ cents per pound and that for the herring 2½ cents. The bait remaining in the freezer up to September 29 of this year being 2,000 pounds of herring.

The Halifax establishment was ready for operation in time to provide bait to applicants at the beginning of the year, and that the expectations of its value to the fishermen during the winter season was fully realized is shown from the following summary. From the 1st January to 25th April, 1906, the frozen herring bait disposed of from that plant was:

To inshore vessels and boats	38,323 lb. at \$1.75 per 100 fish.
To offshore banking vessels	182,090 lb. at 3 cents per lb.
To dealers in bait	29,547 lb. at \$1.65 per 100 fish or 3 cents per lb.
To U. S. vessels	14,040 lb. at 3½ cents per lb.

The bait thus supplied is stated to have turned out first-class and to have given satisfaction to the fishermen. The establishment was able to supply all those who made application for bait leaving about 100 tons on hand at the end of April, and the belief was expressed that the existence of the freezer there was appreciated by those who had already purchased bait and would encourage and stimulate the fishing industry, by removing the uncertainty of supply which previously ruled. The stock of frozen herring on hand was by the end of September augmented to 150 tons, while

SESSIONAL PAPER No. 22

freezing operations were continuing, and it is expected that when the time for using frozen bait arrives, about the beginning of November when the fresh bait supply fails, there will be enough to supply the demand.

The number of small shore fishermen's bait freezers, continues to grow. There are now constructed :

In Nova Scotia.....	29
In Quebec.....	10
In Prince Edward Island.....	5
In New Brunswick.....	2
	<hr/>
	46

During the year there were established in Quebec, three new freezers, one at St. Godfrey, one at Gascons and one at Bonaventure East, in Nova Scotia, one at Digby and one at Lunenburg, and in New Brunswick one at Caraquet.

In addition to these there are under way new freezers at Sydney, at Half Island Cove, and at New Harbour, and in Quebec, one at Newport Point, Gaspé county. There are also in contemplation probably to begin this year, two freezers at Magdalen Islands, one at Carleton, Quebec, and one at Shippegan Island, New Brunswick.

At the outset it was somewhat difficult to overcome the prejudices of the fishermen against frozen bait, the popular fallacy obtaining that it would not be effective and was easily torn from the hooks, but the persistent demonstrations of its practical usefulness, and efficacy, together with the fact of its providing a long felt want, have operated to remove those prejudices, and converted the opponents into advocates of the scheme.

This growing confidence and appreciation is shown by a new feature in these small bait freezers this year. Hitherto this class of freezer has been limited, as above stated, to a capacity of from 15 to 40 tons, but recognizing their value, the associations of fishermen interested at Digby and Lunenburg in Nova Scotia, and at Caraquet, New Brunswick, arranged for freezers with a capacity of 100 tons as necessary to meet their requirements, and the establishments at these places will operate on this increased basis.

Mr. Peter MacFarlane, of New Glasgow, Nova Scotia, the department's officer in charge of the establishment and construction of the shore boat fishermen class of freezers, reports the season as very favourable to a furtherance of the scheme. His report forms appendix No. 12 hereto.

DOGFISH REDUCTION WORKS.

The Fisheries Department Report for the past two years, treats somewhat fully of the experiment of a probable means of coping with the dogfish nuisance, by which that menace to the operations of the fishermen may be turned to some commercial advantage, which, if not wholly satisfactory from the standpoint of the fisheries generally, might form a partial offset to the disabilities involved in the inroads of these predacious fish, at least to the extent to which they may be utilized for the manufacture of oil and fertilizer.

The Shippegan reduction works which were completed last year about the end of the season, were operated at that time only sufficiently to establish the working of the machinery, hence the output was very limited. It started in this year, however, about the 27th July, and has been working continuously up to the time of writing, and it is expected that the season will close with very successful operation and a large output of oil and fish scrap for fertilizer.

The Canso establishment was ready last year when the dogfish first appeared in that locality, about the second week in September, and continued operations up to the end of the season in December.

This year this establishment began operations on the 13th September, and is continuing at the time of writing up to its full capacity.

The experience gained at both establishments last season, which were their initial years, has had the effect of suggesting minor details in methods which will probably result in an improvement in the quality of the fertilizer scrap and oil produced.

While at these points where these establishments are located, the dogfish can be secured in sufficient quantities under existing conditions, the complaints against this scourge, although serious and general, have not been so widespread and acute as in recent years. It may be too soon to hope for relief from this great disability, but it also may be the beginning of a gradual disappearance of the dogfish as the history of the fisheries has shown to have occurred at intervals of varying extent. The present visitation is probably one of the longest and most extensive that has occurred in the recollection of the fishermen.

THE SOURIS FISH DRIER.

The fish drier, which was so successfully launched at Souris last year, with the object of bringing prominently before the fishermen engaged in line fishing for cod, hake, haddock, etc., the expediency and practicability of adopting improved methods for the drying of their catches, in order to enable them to place on the markets of the world an article equal to the best of its kind, and so obtain the highest prices prevailing, and to which extended reference was made at page xxix of the Annual Report of the Department of Marine and Fisheries,—Fisheries,—for the year 1905, continued operations this season under the same efficient management and on the same lines as last year.

Drying started this season on the 8th May, and up to the 21st September there were received at the drier the following quantities of the different classes of fish:—

Dry cod	9,790 lb.
Kenched cod	241,671 "
Green cod	7,257 "
Dry hake	39,686 "
Kenched hake	84,193 "
Green hake	80,476 "

Up to the date mentioned above, the following quantities were shipped:—

Cod	121,113 lb.
Hake (and haddock)	65,438 "

SESSIONAL PAPER No. 22

These fish were shipped to Barbados, Jamaica, Boston, Great Britain, and Charlottetown.

In addition to drying, the putting up of boneless fish on a small scale, was undertaken this season, in connection with which a patent press was installed, for taking care of the scraps and pressing them into blocks. Since this work was started in the latter part of July, 6,595 lb. have been so put up, and have found a very ready sale in both Canadian and United States markets.

That the object for which the drier was established is already being achieved is demonstrated by the fact that in its vicinity a very noticeable increase in the number of men engaged in line fishing has obtained, with a consequent increment in the quantities of fish caught.

THE BEHRING SEA QUESTION AND PELAGIC SEALING.

Last year's report dealt somewhat fully with the most recent formulated proposal of the United States' government, referred to the Canadian government, which was that Great Britain should agree to a prohibition of killing seals at sea during August and September and that the United States would in compensation therefor consent that such hunting should be permitted during May and June instead; these two latter months being within the term of the close season provided by the Paris Award Regulations.

As the net result of compliance with this proposal, would involve the voluntary relinquishment by the Canadian pelagic sealers of the most remunerative two months of the year, comprising practically the whole of the Behring Sea season, for two months when little or no sealing is done, coming as they do between the defined seasons.—that is the spring season up the coast and the fall season in Behring Sea, it is needless to say that this interested proposal did not find favour in Canada and consequently was not entertained. Some pertinent explanations of the situation are contained in the reference above noted. There is no change in the standing of this question since that report.

Owing to the necessity for readiness for an exceptionally early session of Parliament, the report of the department is prepared practically three months before the expiry of the year's general fisheries operations, which precludes the possibility of the publication herein of the usual statistics of the pelagic sealing industry for the current season with notes and remarks thereon, since the requisite data is not yet available.

FISHERIES PROTECTION SERVICE.

The report of the Fisheries Protection Service will be published in a supplement at the close of the calendar year, as the vessels comprising the fleet are now actively engaged on their several stations, it would be impossible to deal with their reports at present.

With the exception of the Steamer *Princess* replacing the *La Canadienne* in the Gulf patrol, the protective fleet of 1906 is the same as the previous one, consisting also of the *Canada*, the *Curlew*, the *Petrel*, the *Osprey* and *Constance* in the maritime

6-7 EDWARD VII., A. 1907

provinces ; the *Vigilant* in Lake Erie ; and the *Kestrel* and *Falcon* in the British Columbia waters. The above cruisers were commanded by the same experienced officers, and were assisted by four sea-going steam launches in the patrolling of the Atlantic coast.

Two United States fishing schooners were seized off the coast of Cape Breton for fishing within the three mile limit. They were subsequently released upon payment of fines.

More foreign vessels must have taken advantage of the *modus vivendi* licenses, as the amount of such fees is much larger than in 1905. The fishing season has still several weeks to run.

OTTAWA FISHERIES MUSEUM.

Last year's report of the Canadian Fisheries Exhibits or Museum contained a list of the specimens embraced in the collection. This year, the curator, Mr. A. Halkett, submits not only a general summary of the said collection, but adds descriptions of the vertebrate portion, especially the fishes, after the manner of the guides to the galleries of the British Museum.

This report will form an appendix of the supplement to the 39th Annual Fisheries Report, to be published at the end of the calendar year with other matters, which it was impossible to embrace in the main report, owing to the early meeting of Parliament.

THE FISHERIES STAFF.

The outside staff of the fisheries branch of the department is larger than may be generally supposed, numbering to over nine hundred and fifty employees, subdivided as follows : Twenty-four inspectors of fisheries and special officers ; 112 overseers of fisheries with magisterial powers *ex-officio*, and 440 guardians, temporarily employed to assist the other officers in the protection of fish. The officers in charge of our thirty-two fish-hatching establishments with their permanent assistants aggregate over seventy employees, not including other persons employed during the busy season. The officers and crew of our protection fleet of cruisers aggregate 267, and there are also about forty-five persons employed as reporters for the Intelligence Bureau during all the fishing season, who are not otherwise connected with government work.

A complete list of these different services will be issued in the supplement to our annual report at the end of the calendar year.

PROVINCIAL AND DOMINION JURISDICTION.

As has been from time to time intimated, since the decision of the Judicial Committee of the Privy Council in 1898, the department has been, by agreement with the provinces, administering fisheries matters, as previously, pending some definitive adjustment of the relative rights and jurisdiction exercisable by the provinces and Dominion in regard to the fisheries.

SESSIONAL PAPER No. 22

The only exceptions to this arrangement is the province of Ontario, to which the proprietary right in the fisheries were handed over at the time of the decision on the fisheries reference to the Imperial Privy Council, and the province of Quebec where such proprietary rights were handed over at that time as affected the inland waters from a line drawn across the St. Lawrence from Pointe des Monts to Cape Chatte. This handing over of property rights involved in the issue of licenses, however, in no way affected the federal jurisdiction as to legislation and fishery regulation, which is exclusively vested in the Dominion government as distinct from any property interest held by the provinces.

It is hoped and expected that whatever agreement may be reached by the conference of Provincial Premiers convened at Ottawa at the time of this writing, touching the relations of the provinces with the Dominion, will pave the way to some basis upon which a final adjustment of the relative jurisdiction of Dominion and Provincial government over the sea-coast and inland fisheries can be reached.

I have the honour to be, sir, your obedient servant,

F. GOURDEAU, Lt.-Col.,
Deputy Minister of Marine and Fisheries.

SPECIAL
APPENDED REPORTS

BY

PROFESSOR E. E. PRINCE, F.R.S., CANADA

Dominion Commissioner of Fisheries.

I. HOW TO ESTABLISH A TROUT-POND.

II. THE PACIFIC FISHING INDUSTRIES OF CANADA.

1906

SPECIAL APPENDED REPORTS

I

HOW TO ESTABLISH A TROUT-POND.

BY PROFESSOR EDWARD E. PRINCE, DOMINION COMMISSIONER OF FISHERIES, OTTAWA.

Travellers in China from early times have marvelled at the zeal and ingenuity displayed by the Celestials in the cultivation of fish and in the maintenance of fish ponds. In Canada, lakes, large and small, are innumerable in every part of the country, with very few exceptions, and as a rule they are, or have been, until recently, inhabited by fish. Trout, speckled (*Salvelinus fontinalis*) gray trout (*S. namaycush*) and red trout in the east, and rainbow, black-spotted, and Dolly Varden trout, in the West, have occurred in vast numbers in these illimitable waters. There are, however, once prolific lakes from which these fish are now absent, while in extremely rare cases, the lakes appear to have been naturally barren and have never contained any fish. I have recently heard of three such lakes, one in the province of British Columbia, the other two in the province of Quebec.

When once a lake or creek has been inhabited by fish, there always remains the possibility of its restoration if appropriate steps be taken: but in those cases, extremely rare in the Dominion, of waters permanently barren of fish, some preparatory measures are necessary. In the present concise report I deal with both kinds of lakes or ponds, and in addition, I give some instructions as to the methods of procedure in creating or establishing new trout ponds.

For the successful cultivation of trout, or indeed of any of the better kinds of fish, it is necessary to secure the following conditions:—

- (1) Pure and abundant water.
- (2) Shallows for spawning, and deeper portions for hiding and for wintering in.
- (3) Food in plenty and variety.
- (4) Shadow and shelter from glaring sunlight.

I take it for granted that proper precautions are taken against enemies, man, beast or bird, as failure in establishing successful fish ponds has frequently found explanation in midnight marauding by poachers, or in visits of sheldrakes, kingfishers, &c., or in other cases mink, otter and other fish-eating animals. Many so-called enemies are, however, entirely innocent of fish destruction. All ducks are not fish-eaters, and sandpipers, plovers, snipe, &c., beaver, muskrat, water-shrews, and similar creatures, do not devour fish: but live almost exclusively on vegetable food, water plants, insects, &c. The fish poacher is the worst enemy, and effective fences are almost essential to success.

I shall deal with the formation of a trout pond, and in the latter part of this report shall treat of the best methods of stocking it with fish.

Water.—The first condition necessary for success is pure water, with, if possible, an inflow and an outflow capable of being regulated by movable gates. Spring water is best, especially if of low temperature in summer, 46° to 54° F. being very favourable.

Trout will live, and indeed, flourish, in still water, with no very apparent inflow, and even in such confined spaces as a rain-tub, a few trout have been kept for long periods: but the fish become tame and languid, the flavour of the flesh is affected, and they are always much stunted in growth. Hence if possible a portion of a stream or

small creek should be so diverted by a narrow channel or underground pipe, that a continuous flow of water can be supplied to the pond or small lake. With such a continuous inflow the trout placed in the pond will be healthier, more gamey, and in better condition generally.

It is well-known that aëration of water goes on at the surface, and any comparatively shallow stretch of water, especially if agitated at times, or ruffled by winds, will be purified, and be able to sustain fish life. I am acquainted with one case in which some young salmon, kept in a bucket placed in a hole in the ground, lived for three or four years in a healthy state; but were much stunted in growth. They grew from a length of $1\frac{1}{2}$ or 2 inches to 6 or 8 inches; but never exceeded that diminutive length.

THE BOTTOM.

The bottom of the pond should be of rock, clay or sand; but loam, mud or peat, imparts a flavour and colour to the water which affect trout unfavourably. Every one is aware that fish, taken in a wild state from lakes and streams, may have a disagreeable flavour, when cooked; at times, indeed, they are quite inedible on that account. If portions of the bottom are covered for a few inches with clear river sand, making a smooth surface, the fish will be found to lie there by preference, as soft mud or clay bottoms are avoided by trout as far as possible. It is absolutely essential that shallows covered with coarse gravel or pebbles should be provided in order that the trout may resort there at the spawning time. They can be netted, when on these stony shallows, and the spawn taken from them, as (unless the conditions are altogether unusual) the eggs if left on the pebbly bottom will become unhealthy and will die. A good supply of water pouring over the gravel, and reproducing the favourable conditions of the natural spawning beds, will of course enable the eggs to be incubated and hatch out in due time. The eggs are, however, better removed from the pond or creek and treated as set forth in my special report published in the twenty-eighth Annual (Fisheries) Report of the Department of Marine and Fisheries, 1895, on the hatching and rearing of trout.

DEPTH OF POND.

An ideal trout pond should increase in depth from the upper gravelly end where the water flows in, and where it is three to six inches in depth, down to the lower clay or rocky portion where the depth should be 5 to 8 or 10 feet or more in depth. To these deeper portions the trout will move for safety and shelter, especially in winter when the danger of freezing in the shallow parts is thus avoided. Further, the small trout will haunt the shallow bottom, while the larger fish will keep in the deeper water, excepting on sunny days or when prompted to indulge their cannibalistic propensities. Large trout will at times readily feed on young trout, and sometimes prefer them, though normally a good supply of insect food fully satisfies them. As a haven of safety for the small fish it is necessary to provide a considerable shallow area in all trout ponds. Three ponds, one for fry and yearlings, not more than 24 inches deep at the lower end, a second for young trout up to 2 or $2\frac{1}{2}$ years of age, 36 or 40 inches maximum depth of water and a third pond, with five feet of water at the deepest end for three and four year old fish is a very convenient arrangement, where feasible.

FOOD IN POND.

The question of a supply of appropriate food is all important. Insect food is really the best, and in a new pond, before an insect fauna is established in it, and May-flies, dragon and stone-flies, &c. take possession and breed, an effective means of creating a supply of water-insects, is the introduction of a tub-full of green-weeds, scraped from the bottom of an old-established pond, or weedy creek of a river, into the pond. Such weed material will be found to contain an incredible amount of insect life, eggs, larvæ,

SESSIONAL PAPER No. 22

&c. and small water-snails in abundance. The weeds chosen should be the matted masses found in still parts of a river or creek. To follow this plan is the readiest method of establishing a supply of insect food, which is undoubtedly the most favourable feature in any successful trout pond. I have, in a former special report, given notable examples of the superiority of insect-food over all other forms of nutriment for half-grown and adult fishes. It hastens growth, improves the flavour of the flesh, intensifies game qualities, making the fish alert and active. Sir James Gibson Maitland recommended a mixture of eggs, flesh, &c., made into a tenacious paste and pressed through a strainer pierced with holes, so that worm-like convoluted fragments were formed. These the fish fed upon most greedily, but it was an expensive food and laborious to prepare. Artificial foods, chopped liver, or flesh, ground-up fish, boiled cereals, &c., prepared in various ways, are far less favourable for fattening trout. Frank Buckland recommended hanging the dead carcase of a bird or dog or even a large fish, from a branch over the pond, and after it became putrid and maggoty, giving it an occasional shake. At each shake the maggots would drop in hundreds into the water and form an admirable food for fish. The fat juicy maggots or larvæ of the blow-fly or blue-bottle fly, are a most nutritious and appropriate food. Trout grow amazingly if fed on insect food, and have better health and finer game qualities than when fed on butcher meat, liver or offal. Young trout greedily catch and eat the minute crustaceans which abound in fresh water: but the cultivation of small Entomostracans, *Daphnia*, *Cyclops*, and the like, cannot be successfully carried out, unless after technical scientific training. For the methods to be adopted for the cultivation of these minute forms of life as fish-food reference must be had to fish-culture treatises by specialists. A few of the smallest species of chubs or shiners will furnish additional food if introduced, and if these small minnows breed, the delicate newly hatched fry, in spring and early summer, will form dainty food for the trout. Care must be taken that no sticklebacks or 'pin-fish' are included with the harmless chub and shiners. The undesirable fish are recognized by the presence of three or more pin-like spines on the back. They are, in some localities, erroneously called minnows (see my report on 'Vernacular Names of Fishes', Report of Mar. & Fish, 1900.) and are surprisingly pugnacious and destructive. Any introduced by accident or mistake should be at once netted and removed, they bite and injure the fry of larger species, and devour an amount of small insect-food wholly out of proportion to their own small dimensions.

SHADY BANKS ESSENTIAL.

Shallow ponds being exposed to the glaring sun readily become warm. Trout cannot bear heat and can live in health only where the water is cool, clear and sparkling. Not only so, but their large sensitive eyes, unprovided with lids or shaded by eyebrows, are exposed to bright light, which blinds and injures them, and introduces sickness and weakness. If the sun is very bright they hide away, when living under natural conditions, moving into deeper shady places, and only coming out in the evening or in the early morning, when the sun's rays are oblique and less powerful. A few trees carrying thick foliage, or a row of low overhanging bushes, willows or alders, will provide the necessary cool shelter, if so situated that some of the deeper parts lie in shadow when the sun is high at mid-day. Floating wooden rafts or screens are preferred by many as the falling leaves in October are a source of annoyance, where trees are planted for shade purposes.

PONDS SHOULD LIE FALLOW.

The pond having been prepared and the foregoing conditions having been observed, it should be left for two or three months in spring until its newness has worn off and the insect and minnow life have become established.

HOW TO STOCK (ADULT FISH OR FRY).

A few dozens of adult wild trout netted, under the authority of a permit, which the Hon. the Minister of Marine and Fisheries, Ottawa, has alone the power to issue, should be conveyed in casks of water or tanks, and liberated in the pond.* They should be left undisturbed for a year, fed if it seems necessary, but not distributed or fished for. Many of them will be observed seeking the gravelly shallows in due time for the purpose of spawning. They might be allowed to spawn naturally during the first season, especially if they have been caught in the late summer, or fall; but the eggs will probably not incubate and hatch out in the confined area of an artificial or newly established pond. In later seasons, the eggs, as already stated, should be taken from the fish, fertilized, and incubated, and hatched artificially, as better results can be relied on, and many dangers can be thus avoided. In the second year angling may be carried on, and all but the largest trout returned to the water, unless very badly hooked.

Some trout culturists prefer to stock ponds with small trout-fry, either newly-hatched, 5 or 6 weeks old, or fingerlings, 9 to 12 months old. If the conditions are favourable this stocking with young fish, either "alevins" or "fingerlings" is bound to be successful: but three or four years at least must elapse before the pond will furnish any angling. The rate of the growth of trout and other fish need not be dwelt upon in this place, as I have treated the subject in my special report on the "Maximum Sizes of Fish" in the Department's Report, 1903. It is difficult to give definite directions respecting the number of fish, which can be safely retained in a pond: but a spring $1\frac{1}{2}$ in. square in volume, at a temperature of about 50° F. and flowing through a tank 24 ft. long, 2 ft. wide, and $1\frac{1}{2}$ ft. deep *i.e.* 72 cubic feet capacity will accommodate a thousand trout 9 to 13 inches long. Norris regards such accommodation as favourable, *i.e.* 10 trout to each cubic foot of flowing water. The trout were fed on curds every second day— $2\frac{1}{2}$ quarts to a thousand fish. Half that number would, as a rule ensure better growth and more healthy fish.

RESERVE POND DESIRABLE.

It may be added that a very advantageous arrangement is that of providing an additional pond, one flowing through a narrow channel into the other. The formation of two ponds affords many advantages. If gates be provided and a lateral overflow pipe be arranged, one pond can be run dry when desired and the fish taken out, or the bottom of the pond cleaned or rearranged. The Hon. Roger North, one of the earliest English fish-culturists, recommended the drying of fish-ponds at intervals. He advised that they should lie fallow like a field, and the grass be allowed to grow: but he had in view the coarser kinds of European fish living in weedy sluggish waters, not those finest fish of all the finny tribe the trout of clear English and Scottish streams or of Canadian lakes and rivers. Further, the migratory trout, when passing up the narrow channel on their way to the gravelly shallows, which are suitable for spawning beds, can be secured either by means of barrier-nets of small mesh, placed across, or by an arrangement of wire-cloth movable gates; both these devices allowing the water to flow through, but barring the fish and retaining them until convenient for taking the eggs and incubating them in a hatchery.

Finally, owners of trout ponds hardly need to be reminded that, even though trout are confined in privately owned enclosures, the provisions of the Dominion Fisheries Act and Regulations under it apply to them.

* Norris states that he carried 150 adult trout, for a distance of 60 miles, in a 40 gallon cask, two-thirds filled with water, and with a piece of ice dropped in now and then.

II.

THE PACIFIC FISHING INDUSTRIES OF CANADA

BY PROF. EDWARD E. PRINCE, COMMISSIONER AND GENERAL INSPECTOR OF FISHERIES
FOR THE DOMINION OF CANADA.

The Pacific fisheries of Canada are carried on in the waters, marine and fresh water, of those two vast geographical divisions, the Yukon District and the province of British Columbia. The former may be described as having roughly the form of a right-angled triangle, whose base is an arc of the 60th parallel of north latitude, its perpendicular an arc of the 141st meridian, and its hypotheneuse, the Rocky mountains; and the latter territory (British Columbia) may be compared to an enormous quadrangle, 700 miles long by 400 miles wide, stretching from the 49th parallel (or more correctly, from an imaginary line in the middle of the Straits of Fuca, continuous, off Point Roberts, with the 49th parallel) up to the 60th parallel, and including the adjacent islands, large and small, south of the 55th parallel. The inland waters are comparatively unimportant as compared with those of the sea, when viewed from a commercial standpoint. The rivers are, it is true, of the highest value as the breeding resorts of salmon, and the upper waters, the lakes and streams, furnish food for the native Indian tribes, for the settlers, and inland communities. The lakes on the whole are not prolific, but many of the mountain streams and large tributaries cannot be surpassed for the excellence of the sport they afford. Nowhere can the angler find trout (rainbow, mountain spotted or cut-throat, and Dolly Varden) of finer game qualities. About a hundred and fiftieth part of the total area of British Columbia consists of lakes, while in the Yukon District the lakes, it is estimated, cover barely one three-hundred-and-fiftieth of the total geographical area. In these lakes and rivers large trout occur, some reaching a weight of 20 lbs. to 30 lbs., while whitefish, small grayling, and certain land-locked species of salmon, are also found; but their total value in the Yukon Territory and in British Columbia does not exceed \$150,000 per annum.

The sea-fisheries are amongst the most prolific and valuable in the world. They have been developed along the coast of British Columbia to a marvellous extent, and they are capable of enormous expansion. The amazing feature of these fisheries is that they may be carried on in waters perfectly land sheltered. Hecate Straits, Dixon Entrance, Queen Charlotte Sound, and the Straits of Georgia, with innumerable deep inlets, bays and arms, are so shielded from the open ocean as to furnish unique conditions for the pursuit of fishing operations. Vancouver Island and the Queen Charlotte Islands form a barrier against the storms of the waters outside, while the shores of these islands are themselves penetrated by extensive channels, arms and bays abounding, like the adjacent ocean waters, in the most valuable economic species of fish. The investigations carried on by a committee of the British Columbia Fishery Commission, during the past summer (1906) proved that extensive feeding grounds for fish occur on every part of the coast from Victoria to Naas river. The bottom is in numberless places literally alive with invertebrate animals, especially shell-fish, annelids, shrimps, and sand stars, which constitute a very large part of the food of the most esteemed kinds of marketable fishes. The greatest spawning and feeding grounds in the world for herring, halibut, flat-fishes allied to the plaice and sole, and numerous other food fishes occur within the vast sheltered area (covering nearly 30,000 square miles) extending from the international boundary line on the south to the Alaskan limits in Dixon Entrance on the north, and shielded from the open ocean by Vancouver Island and the

Queen Charlotte Island group. The number of large rivers which take their rise on the Pacific slope of Canada is astonishing, including, with one or two exceptions, all the great salmon rivers on the western watershed of North America. The Fraser, Columbia, Thompson, Skeena, Naas, Stikine, Liard, Yukon, Pelly, Porcupine, Peel and other vast streams all have their sources in British Columbia or the Yukon District, and most of them rank as the greatest salmon rivers in the world, and flow during their whole course through Canadian territory, though some like the Yukon, the Stikine, and the Columbia debouch into the sea beyond its boundaries. It is an axiom amongst fishery authorities that food fishes improve in flavour and quality in cold northern waters, and it must be admitted that these Pacific fishing grounds possess for that reason an enviable position. But the very plenitude of these fishery resources prevented a proper appreciation of them for many years, and even yet their real value, and their importance as entitled to rank amongst the greatest fisheries possessed by any country, are generally underestimated. While the salmon canning industry has for a quarter of a century occupied a prominent place amongst Pacific commercial enterprises, it is barely fifteen years ago since the immense value of the British Columbia halibut banks in Hecate Straits and Dixon Entrance was first appreciated, while the rich herring harvest along our Pacific shores went to waste until five or six years ago. 'More money has been sunk in mines than will ever come out of them,' said an eminent British Columbian to me some years ago, 'and,' he added, 'even after our lumber has all gone and our forests have been cut down, our fisheries will still remain to supply labour and food, and are our most permanent natural resource.'

That other fishery enterprises than the salmon industry urgently call for development has long been apparent to those familiar with marine and fresh-water fisheries. With my extensive experience, as a fishery official in both hemispheres, and my special knowledge of the North Sea and Irish fisheries, as well as my complete knowledge of the vast fisheries of Canada, I was more than twelve years ago impressed with the unlimited possibilities of the British Pacific fishery resources. My public statements to that effect and my efforts to stimulate interest in deep-sea fisheries were not adequately seconded, mainly because the firms prominent in the salmon business were largely engaged in other enterprises, shipping, general supplies, grain, furs, etc., and were not really fishing firms whose chief interests were bound up with the fish business. Certain United States firms were, however, not slow to grasp the commercial value of the deep-sea resources of the province, and to them is largely due the growth of important halibut fisheries, and the like.

SALMON.

The salmon industry of British Columbia claims the first place in any review of the provincial fisheries, but the details are so well known that it is necessary to refer to certain salient features only.

Since salmon canning operations began in a small way on the Fraser river in the 'sixties,' until the present time, when about seventy canneries are operated on the coast, its growth has been gradual and healthy. The main operations have been confined to four centres, the Fraser, the Skeena, Rivers Inlet, and Naas river, each, excepting the last, separated by a distance from each other of from two hundred and fifty to three hundred miles. At Lowe inlet, Namu, Alert bay, and at Clayoquot, on the west coast of Vancouver Island, canneries have also been long in operation, but the principal centre, with 42 canneries, has been the Fraser river. Twenty years ago, in order to guard against excessive fishing, the limit of 500 was placed upon the number of fishing licenses issued; to-day over 3,000 licenses are issued, the licenses being required not for canning or packing but for fishing. During the greater part of the history of the industry one kind of salmon may be said to have been mainly handled, viz., the sockeye, the vermilion-fleshed salmon of the Fraser and of British Columbia rivers generally. Spring salmon or chinooks, cohoes, dog salmon, hump-backs, and steelheads, were plentiful though infinitely less so than the marvellously abundant sockeye, and these less important fish were frequently thrown away. Some were smoked, others salted or frozen, but the British Columbia salmon par excellence was the sockeye.

SESSIONAL PAPER No. 22

A widely prevalent belief exists that every fourth year is a 'big year' on the Fraser, and no doubt some foundation exists for the belief, though the periodicity is not perfectly confirmed. Large runs during the last thirty years have, indeed, occurred three times in 'fourth' years, twice in 'fifth' years, once in a 'sixth' year, and three times in a 'third' year. There is however, even less semblance of periodicity in the northern rivers of the province. With the increasing demand for fish, salmon, other than sockeyes, have been increasingly canned in British Columbia, and official statistics show that of the salmon pack on the Fraser (1904) of 129,000 cases, over 51,000 cases were of these previously neglected kinds of salmon. In the last big year (1905), of the total Fraser River pack, 846,988 cases, 39,647 were cohoes, spring salmon, &c. Formerly the pack was made up of 1-pound talls, whereas now the demand is for 'flats.'

Other changes are observable in the industry. The Indians and white fishermen have been largely displaced by Japanese. It is stated that 85 per cent of the Fraser river fishermen are Japanese, and in some canneries 90 out of every 100 employees are from Japan. Chinese labour prevailed in the packing establishments owing to its cheapness, but the price of that Oriental labour has immensely increased: \$30 to \$40 per month, in addition to board, being now paid by some canneries. The question of labour is one of the most serious to be faced in the Pacific salmon fishery as in so many other western industries. Hence labour-saving machinery is being increasingly introduced. Already salmon canning involves some of the most wonderful labour-saving machinery ever invented, including full lines of can-making machines, by which the tin cans are manufactured from tin plate, ready to be filled; fish cleaning machines by which the fish are opened and cleaned as thoroughly, and much faster, than by hand; fish-cutting machines by which the salmon are cut into pieces of the appropriate size for the cans; filling machines by which the cans are filled with fish at the rate of one can per second; topping machines by which the covers are fitted upon the filled cans; crimping machines by which the covers are crimped after being fitted, and soldering machines by which the covers are soldered on the filled cans—all working automatically and in conjunction with one another in the utmost harmony.

No question as to the cleanliness in handling the product can legitimately arise. It is scarcely touched by hand, and never carelessly treated, as the above enumeration of devices used in these great canneries demonstrates, while each establishment is kept as clean and sweet as a well regulated kitchen.

The Fisheries Commission authorized by the Dominion Government to investigate the fisheries in 1905 and 1906, paid visits of inspection to the various salmon canneries, especially those on the Fraser river, and their report upon the cleanliness of the methods adopted, the abundance of fresh water, and the rapidity characterizing the utilization of the fish after capture, was of the most reassuring and satisfactory nature, in view of the 'revelations' made public in the meat canning industry of the United States.

The process of handling the fish has often been described. But the following brief summary may be given. After the salmon reach the cannery they are conveyed to tables where the fish are cleaned, head and fins removed, and after being cut into small 'chunks' by machinery, they reach the women who act as 'fillers.' These fill the cans by hand and place them on a conveyor where they go to the crimping machine. As they pass through this, the cans are scrubbed till they fairly shine. In the washing of the exterior of the cans, steam is used. After this, it is a mechanical process pure and simple. The filled and topped cans drop on an incline through the soldering machine, and then the cans are allowed to cool, preparatory to being taken to the retort.

The first hot bath of the canned sockeye lasts thirty minutes.

Placed on tables, the cans are then pierced by a small hole at a marvellously rapid rate by trained employees. The vent allows the gas to escape as well as the surplus heat. Following the venting, which takes but a few minutes, the cans are again hermetically sealed and in they go to the steam retorts at a temperature of 240° F. and a pressure of 15 pounds to the square inch.

It is not possible for an atom of foreign matter to get into the cans of salmon in any of these various processes. The strictest care is exercised. In fact, the whole process is so rapid that there is absolutely no chance for contamination.

An hour and a quarter is the time given in the steam retorts. Here the sockeye becomes the tender, rich and well flavoured article of commerce in such demand. Every essential ingredient which nature implants in the sockeye is retained—not an iota is allowed to escape. The process makes absolutely certain the keeping qualities of the canned fish—it is not to be compared with any other treatment of fish of any kind. Trucks carry the canned product from the retorts, steaming hot, to the warehouses where the cans are cooled gradually.

Labelling by machinery comes next, after lacquering in the same manner, and then comes the casing. Here again machinery plays the main part. The boxes, made of spruce, utilizing thereby a great lumber product heretofore well nigh valueless, are supplied ready to piece together. The nailing machine in the hands of a skilful operator puts them together at a marvellous rate. Then the case is finished.

Many attempts have been made to fill the cans by machinery, but the result has never been perfectly satisfactory, the steaks of fish being pressed and jammed, so that bones, skin and scales are mingled together, and present a very undesirable appearance, whereas in hand-filled cans the pieces are carefully placed in the can, the skin and scales, as a rule, outside, and the appearance of the contents when opened is agreeable and appetising. More success has attended the effort to gut and clean the fish by machinery, thus avoiding the handling by Chinamen of the salmon fresh from the boats. The 'Iron Chink' or Smith cleaning machine was brought into use in 1905. It has the form of a large rotating wheel of complicated structure, and it is claimed that it cleans about 30,000 fish in a run of ten hours, and when running at full capacity does the work for which 51 expert Chinese cannery labourers were required. It needs about two horsepower to operate it. Only two operators are required to prepare a fish for the cleaning machine as it is now operated. The first man takes the fish as it comes down the elevator and guides it past a knife which cuts the head off. The second passes the fish by the knife which cuts off the tail. The fish is then ready for the machine and is placed in the feeding trough. It passes through the trough tail first and the back fins of the fish come into contact with a self-sharpening knife which trims off the large and small fins. An automatic feed in the trough works consistently with the clamps on the wheel, six in number, and the fish is caught in the clamp by the tail, carried up through a centering device which holds it firmly, when the back clamps close on it. Self-sharpening, self-adjusting knives at the top of the machine remove all the remaining fins in a uniform manner and the fish passes on down to the splitting saw, which is situated about one fourth of the way down from the top. The saw splits the fish in the exact centre, and it passes on, coming in contact with a rotary grappling device which removes the entrails and stirs up the blood on the backbone, leaving it ready to be washed out with the aid of a stream of water and a rotary brush. The fish then travels on to within three inches of where it entered the wheel, and released, it slides on to a conveyor. After that the fish passes through the remaining processes above described. If the fish vary very much in size, the machine is apt to miss removing some of the fins and some hand cleaning is often necessary after the fish, 'gutted and finned' comes from the 'chink'. The apparatus is already installed in some of the British Columbia canneries, and a great many were operated in the United States canneries. I saw it in use in the Pacific American Company's cannery at Bellingham. This is the largest salmon canning plant in the world, and during the past season seven lines of machinery were operated. The two machines which were in operation there supplied the seven lines of machinery which packed on an average 9,000 cases of sockeye salmon a day, and two or three days ran over the 10,000 mark. At no time during the entire season, while the scows were bringing in the fish from the traps, was the canning machinery delayed for fish to pack. The iron chink kept them continually supplied and the lines of machinery never were idle for want of fish and frequently there were from 30,000 to 70,000 fish cleaned ahead.

No doubt in small canneries, and in seasons when the run of salmon is limited, a costly machine of this character may be less economical than the method hitherto general of employing Chinese cleaners and Indian klookhmen and white women as fillers.

SESSIONAL PAPER No. 22

Recently, there have been signs of a movement northward of canners, who regard the Fraser river as in peril, owing to excessive fishing in the Straits of Georgia and Puget Sound. A great increase in the number of canneries in the north, and along the west coast of Vancouver Island is certain, within the next two or three years.

Perhaps the most remarkable development is that of the dog salmon industry. These fish until recently were regarded with contempt, but so great is the demand from the Japanese market that more than 3,000 tons, dry salted, were shipped last year from the province. Just as the turkey is the universal dish at Christmastide with us, so a salted dog salmon is the chief item at New Year feasts in Japan. The usual price is said to be 50 cents each in the Japanese markets. Certain Japanese firms are prominent in the British Columbia dog salmon industry, and one of them salted over 58,000 of these fish in 1905, a total weight of nearly 200 tons (the salt salmon averaging 7 pounds, i.e. 300 to a ton).

In the adjacent United States territories, especially in Alaska, this salt dog salmon industry has assumed importance, but the recent Japanese tariff bill provides that fish must be caught or taken by Japanese fishermen on board Japanese ships in order to secure free entry into the Mikado's dominions.

The United States laws will not permit Japanese fishermen carrying on the fishery in Japanese bottoms, and a duty of 2 yen per 132.9 lbs. (i.e. about \$1 per 133 lbs.) will be exacted by the Japanese authorities. The United States Consul General at Yokohama recommended meeting the case as follows:—

‘If it is the desire of the United States government to promote the export of dry salted dog salmon from Alaskan waters to Japan, it would seem to me that the simplest way to do this would be by letting the Japanese catch their own fish in Alaskan waters, charging them a tax on every dog salmon caught, and stipulating that no other kind of salmon be taken. There would be no trouble over this, as the habitat, etc., of the dog salmon is well known, and further, as they always run by themselves and do not mingle with sockeyes, king salmon and other high grade fish.

Dog salmon, outside of the Japanese market, have little, if any, commercial value in Alaska. They are not fit for canning purposes and at present are only caught for this market. As above stated, this will cease if the Japanese obtain the fishing rights which they expect from the Russians, but if Japanese were permitted to catch their own dog salmon in Alaskan waters there is no reason why they should not pay a tax of about 5 cents gold on each salmon caught, bringing in an annual revenue to the Alaskan territorial government of from \$50,000 to \$75,000.’

The consul believes that the present law should be changed for the reason that the sole market for Alaskan dog salmon lies in Japan and, inasmuch as the Russian fishery rights conceded by the treaty of Portsmouth are very problematical, a vast increase in the trade would be effected by complying with Japanese requirements for free entry. On the other hand, a royalty might be obtained by way of a tax on every dog salmon caught and stipulating that no other kind of salmon be taken.

The dog salmon industry in British Columbia, is, however, largely carried on by the Japanese themselves, who capture the salmon under license, and cure and prepare them according to their own methods.

Quinnat or spring salmon, cohoes, steelheads, &c., are also shipped frozen, smoked and variously prepared; indeed one firm is known to have sent 150 to 200 tons each season to the German, French and other European markets.

The methods of fishing legally permitted in the province are few. Drift or gill-nets of a prescribed mesh, purse and drag seines, and in a restricted stretch of coast, viz., from Victoria west along the shore of Vancouver Island, the staked trap-nets are licensed; but the use of traps was until recently prohibited and, in the permanent interest of the salmon supply, they are not permitted generally by the Dominion government, in whose hands the supreme jurisdiction rests. Enormous catches are at times made in salmon traps especially when there are big runs, no less than 340,000 salmon being taken by one trap of the Pacific American Fisheries Co., in Puget Sound in 1905. There is, however, great uncertainty in the working of salmon traps.

While the drift-nets are simply a hang net suspended from a line of corks or wooden floats, and attached at one end to the small row-boat of the gill-net fishermen, the trap-net is a much more costly and elaborate affair. The gill-net varies from 50 to 75 or even 100 or 110 meshes in depth, and is 150 to 300 fathoms in length, the mesh as defined by law being $5\frac{3}{4}$ to 7 inches in extension measure. The trap-net consists of a 'lead' or wall of net fixed to massive piles running out from shore 400 or 500 fathoms. It leads the fish into a terminal inclosure, the 'heart' the entrance being a narrow door or slit on each side of the 'lead.' A cone shaped 'tunnel' leads from the heart into the 'pot' or final trap, so that the fish passing through this horizontal funnel have no means of returning. Alongside the pot is a further quadrilateral inclosure called the 'spiller' into which the fish are admitted when the pot becomes filled and crowded with fish. In a 'big run' the pot has been known to become so packed with living salmon, that the sheer weight of the uppermost fish crushed and killed those on the bottom of the net. It is said that some catches in Puget Sound were so enormous that the bottom could not be raised and the 'brailer' or seine-like web passed beneath the fish in the pot and raised by means of a winch, could not be used. The pot had to be cut out and towed to the cannery. Traps cost from \$5,000 to \$15,000 or even \$20,000 and in British Columbia, only 2 operated in 1904, 16 in 1905, and in 1906, 26 locations were licensed.

HALIBUT.

The halibut of British Columbia have an enviable repute. If not quite equal in whiteness and firmness to the Icelandic and North Sea fish, they are less overgrown and of finer texture. They do not reach the dimensions of European halibut, a length of five to six feet and weight of 250 pounds being exceptional, whereas much larger examples are common in the German ocean and are in great demand in the London markets. The waters between Queen Charlotte Island and the mainland, especially off Rose Spit, and off the west shore of Banks Island, were at one time veritably overcrowded with halibut. They literally 'paved' the bottom of the sea, indeed in 1893 an experienced fisherman informed me that the tug on which he was employed, secured 180,000 pounds of fine halibut in the short space of seven hours. Many fish were rejected owing to small size or, on the other hand, excessive dimensions. Some of the halibut weighed 140 lbs. and so crowded were the waters fished that the baited hooks scarcely reached the bottom before the fish took them. As a rule the sides of the fishing tugs had to be built up with boards in order to retain the excessive catches so easily and rapidly made. The halibut are scattered all over the straits, but regular migrations have been noticed, and where the waters of Dixon Entrance meet the currents, moving from the south through Hecate Straits, and food appears abundant, the fish thickly congregate there. The fish often move into very shallow water, and far up the deep inlets such as Gardner, Bute, and other inlets, the Indians from time immemorial have been in the habit of taking them. Along the west shore of Vancouver Island, halibut are plentiful, indeed, in the coast waters of the province generally these esteemed fish are captured. Further north in the Alaskan waters halibut occur, but in diminished numbers, while the once prolific areas northwest of Cape Flattery have long been 'played out,' a few small sailing vessels from Seattle still, however, obtaining catches there. Besides the fleet of New England Fishing Company's halibut tugs, there are a number of independent steamers engaged in halibut fishing, and operated by Canadian firms, one, the *Celestial Empire* being the first to use the otter trawl; but the *Flamingo* also operates that very effective form of net.

The steam vessels 130 to 150 feet in length which resort to the northern banks have 10 to 14 dories, each carrying two men, and these fish within a radius of seven or eight miles. From 7,000 to 10,000 lines of 'trawls' are used and the snoods are from three to six feet long, and salt or fresh herring is the bait mainly used. From the middle of September to the middle of March is the principal fishing period, but in May and early June many large halibut move into inshore shallows, especially on the east side of Graham Island. There the Indians have long been accustomed to take them. The New England Fish Company has received special concessions from the Dominion

SESSIONAL PAPER No. 22

government and are the principal halibut fishing firm operating in British Columbia waters. These concessions, for which any foreign company is eligible, include permission to land and tranship in bond, through Canada to the United States, catches of fish caught in U. S. bottoms, and to purchase ice and supplies under rules laid down by the Hon. the Minister of Customs of Canada. Certain provincial firms also take part, and vessels from Seattle, Tacoma, etc., exploit the halibut banks. Boats of 60 or 70 tons propelled by motor power 50 or 60 HP. are coming into use, facilitating quick trips to the fishing grounds and back to the Puget Sound markets. The annual catch is officially valued at about \$500,000, but this does not include halibut locally smoked, cured, etc. In spite of rumours that the banks are being destroyed, there is much evidence that the halibut are still more plentiful than on any other grounds in the world, and if some wise protection can be devised to prevent the destruction of fish at the spawning time, the industry has still a great future before it. Though the original abundance of the halibut has been reduced by excessive fishing yet single vessels during the past season have taken from 80,000 to 130,000 pounds of halibut in a single day; indeed about the middle of August last the new halibut steamer *Manhattan* built in the United States for the New England Fishing Company secured the largest single catch recently recorded viz.: 170,000 lbs. of halibut, or 10,000 lbs. more than the steamer *New England* which about the same date brought down 160,000 lbs. of halibut. Most of these fish, indeed all the best catches are made at that time of the year near Goose Island between Princess Royal Island and Queen Charlotte Sound, and no great distance from shore. Certain steam halibut vessels are known to have cleared in one season \$80,000 after paying the expenses of the several trips, and the catches after being shipped east would yield even larger returns to the wholesale and retail dealers. Reliable estimates put the annual catch of halibut in British Columbia waters at 20,000 to 25,000 tons in recent years, or nearly ten times the total weight of fresh water fish caught in Lake Winnipeg in a single year.

The incoming of vast numbers of settlers into the Northwest provinces, and the growth of new towns and settlements east and west of the Rocky mountains is already creating a market of great proportions for Pacific sea fishes. Fresh halibut will soon be in large demand there; but other methods of sending these fish into markets can be adopted. Halibut, codfish and other Pacific fish products are readily canned, smoked, &c., and certain Seattle fish firms are developing a business on these lines. New enterprises of this nature are capable of rapid growth in British Columbia.

BLACK COD OR SKILL.

The black cod (*Anoplopoma fimbria*) abounds in the northern waters of the province, especially along the western shores of Queen Charlotte Islands. It favours deep water especially depths of from 70 to 90 fathoms, though it is found at depths of 200 to 250 fathoms. It is never caught in the surface waters and avoids shallows. The native Indians have long fished for this species in November and, again, in March and April, but it may be taken in other months though the Indians have not taken it at other times, being in December and the New Year season too much occupied with feasts and conviviality even if stormy weather did not prevent fishing operations then, while the salmon fishery, etc., occupied them at other times.

The black cod is a most delicious food fish, of firm and flaky texture, while it is white in colour and rich in flavour. It is flaky like the haddock, but richer in oil. Owing to this rich, oily character it is far more appetising than the drier and firmer true cod. It has been compared to the mackerel though not very appropriately, but is related to and indeed bears some resemblance on the table to the large whiting, i.e., the true European whiting (*Gadus merlangus*) a fish wholly differing from the inferior, so-called whiting of our western waters.

The mouth of the black cod is tender, and to hook it successfully demands care. Very long lines are used, each line carrying 120 to 150 hooks fixed on snoods at regular intervals. The total cost of the fishing outfit does not exceed \$30 or \$40. Herring are the principal bait used, but the cuttlefish or squid, cut in small pieces, is far superior,

being a more consistent and lasting lure. The boats used are of the ordinary Columbia type carrying two men and, in case of the Indians, their wives usually accompany them. In curing the fish it is usual to cut off the head and tail, remove the backbone and salt and split the fish. Experiments have been made in bottling and in canning these fish with good results, but ordinary salt-pickle has not on the whole been successful and when put up after the manner of salt cod the fish 'rust' as a rule, while very strong pickle spoils their edible qualities. They are very apt to turn rancid when lightly salted, though some samples sent in a chilled condition to the east were pronounced very good. The most successful method has proved to be 'double' pickle; that is after pickling once, the fish are taken out and pickled a second time for from two to five days. The second pickle is boiled and the fish are replaced in that fluid after it has cooled and then shipped to market. Such fish have been in great demand where sample shipments have been tested.

OULACHON.

That the oulachon has not become a recognized fish in the best markets is a matter of surprise to most people who have learned to appreciate its rich and palatable qualities. It is a small fish, about the size of the smelt, and from the Naas river in the north to the Fraser river in the south, it occurs in great abundance from early in March to the middle of April. The schools entering the northern estuaries, especially the Naas, are incredibly vast. They crowd in so thickly that the Indians from an early period have been accustomed to make large catches by a very rude and, at first glance, inadequate method. Taking a pole about 10 feet in length, they insert nails, set about an inch and a half apart, and projecting like the teeth of a comb. Fastening this implement over the side of his canoe, the Indian draws the pole quickly through the dense school of moving oulachon, and with a backward sweep, impales a number of the fish, which he shakes off the sharp teeth into the canoe and then repeats the operation. In two or three hours it is usual to secure in this simple fashion a boatload of these esteemed fish. Seines are in some localities used and small meshed gill-nets.

Like the smelt, the oulachon soon loses its delicate flavour, and when cooked and canned the flesh drops from the bones, so that it presents, when the can is opened, a jumbled, uninviting appearance. In a freshly caught condition it is a most delicious fish, and when salted, or rather pickled, it is after boiling, a very toothsome article of diet, being most digestible and nutritious. Indeed the flesh of the oulachon is stated to be as restorative to the wasted human system as cod-liver oil. Related as the oulachon is to the trout and salmon it has few bones and the flesh is solid and flaky. When cooked the flesh is easily removed by passing a fork along each side of the backbone and on that account it is more convenient for table use than most small fishes.

The oil, which is so abundant in the tissues of the oulachon, has very superior qualities and might be made commercially important. The flesh is so permeated with the oil that it is commonly called the candle fish, and by simply inserting a piece of pith through the axis of the fish, when dried, it may be used as a candle or torch, the pith burning like the wick of a well-filled lamp. The Indians merely press vast numbers of the fish into a wooden vat or barrel and allow the oil to ooze out by sheer pressure. It rapidly turns rancid and is most offensive in odour, but is highly relished by the Indians all along the British Columbia coast. Oulachon oil is a universally esteemed condiment. The Haida Indians who are unable to secure supplies of this fish on Queen Charlotte Islands are accustomed to cross over to the Naas and Skeena rivers, where they barter their halibut and other products for the much-prized oil. The oil is consumed with seaweed, berries, dried fish-roe, and, indeed, with every form of food. White settlers who have lived long upon the coast acquire a relish for this crude oil preparation, but a refined and clarified oil would be an attractive and merchantable article, if it were placed upon the market.

When the enormous schools of migrating oulachon crowd in solid masses into narrow estuaries to reach their spawning resorts, a short distance up from open sea, they are destroyed by every imaginable enemy, seals, porpoises, sea-birds, even bears and land

SESSIONAL PAPER No. 22

animals join in the destruction. I have repeatedly found huge sturgeon whose stomachs were packed with partly digested oulachon.

No doubt some satisfactory method of preserving these delicate and esteemed fish will be soon found, and a new and remunerative industry would rapidly develop, while the oil would stimulate a demand owing to its medicinal properties.

SMELT.

Of the two species of smelts found in British Columbia waters little use has been made apart from limited captures, for the local markets. Both species (*Osmerus thaleichthys* and *Hypomesus pretiosus*) are plentiful in the fall and early months of the year. They are taken by means of small mesh drag seines in numerous estuaries and inlets, and a smelt industry could be rapidly developed by more systematic and business-like methods. The annual value of the smelt fishery is officially estimated at about \$20,000 as compared with an annual value of \$500,000 or \$600,000 on the Atlantic coast of Canada. Inspector C. B. Sword recently pointed out in a report, regarding the smelt: 'As yet there has been no attempt to any extent to find a market for these fish abroad, and the figures given represent merely the local consumption * * * It can only be a question of time before, by shipping them in some form which will retain their flavour, a large and profitable export business will be carried on in them.'

There is a great opening in the Orient for dried smelts, and some United States firms have already pickled and dried large quantities, and a cured smelt industry is likely to assume large dimensions.

HERRING.

Herring are caught on every part of the British Columbia coast. Those in the more southerly areas, while incredibly plentiful, are of smaller size than the less abundant schools of the north, where the herring reach a size almost equalling the large Labrador herring. In the Straits of Georgia the schools in certain months of the year, usually the fall, may extend for many miles. Indeed in 1893 I was informed that a small tug passed for three hours through a continuous mass of migrating herring in the month of June, while I myself have seen in February dead herring thickly covering the surface of the sea near Nanaimo for a distance of over two miles. Purse seines of 1-inch extension measure were tried 14 or 15 years ago in March and April with considerable success. There seems to be little doubt, that, if the movements of the schools could be ascertained as, indeed, is possible only by an accurate scientific survey, herring could be captured in enormous quantities during the whole year as in Scottish and English waters. Until the present time, the fishermen have been content to await the arrival of the herring in the bays and inlets usually frequented by them at the close of the year and in the New Year. The principal centre of the fishery is Nanaimo and the vast schools, as a rule, move in about the middle of November. As an illustration I quote from a local journal of November 15 last the following:

'The patience of local fishermen was amply rewarded to night when the first shoal herring came rushing into the harbour in a perfect tempest of fright seeking shelter from the school of whales following them, spouting and blowing like porpoises. Immediately a large fleet of fishing boats put off and cast the nets as the herring swept around Protection island, as they had been on lookout night and day for the past ten days for the first run. By eleven o'clock the first cast had been hauled in and placed in casks totalling ten tons. The fishermen estimate that to-night's catch will reach twenty-five tons. To-night's run is only a slight corner of the immense quantity that will now visit the harbour daily.'

Until five or six years ago the herring apart from a very small local demand were practically unutilized, excepting for bait and for guano. The Indians collected quantities of herring spawn which they dried and used for food called 'skoe' (pronounced 'skir'), and, indeed, adopted the device of placing cedar boughs on the shallow spawning grounds, and to these boughs the herring attached their glutinous ova. A few Scottish fishermen are stated to have used herring drift or gill-nets in the open waters

of Queen Charlotte Sound and the Straits of Georgia and to have taken a fine quality of herring in the month of August. The herring which crowd into shallow bays and estuaries are as a rule deteriorated. At any rate the first captures are the best in quality, and in the future no doubt steam herring drifters will be used as on the British coast. In my special report on Canadian herring curing, I pointed out that in order to produce a good cured herring it was necessary to take the herring at the proper time when in best condition. The most esteemed herring are the so-called matties or 'matjes', in which the roe and milt are only partly developed, while the 'full' herring with the roe large and fully formed, but not fat, are also in great request. The thin, spawned, or 'shotten' herring is of far inferior grade and it is these fish which have been hitherto largely taken in British Columbia.

There are many methods of putting up herring, but the greatest demand is for salted herring in pickle—these being mainly used by Germans, Russians and other peoples on the continent of Europe, who prefer to eat them raw with accompanying vegetables. Red herring, the deeply coloured, highly-smoked kind; bloaters, a dry lightly cured and very slightly smoked herring which will keep only a few days; kippers, a split well smoked variety which should be eaten within 8 or 10 days, and boneless herring, an industry developed recently on the coast of Maine, and demanding over 500 tons of herring per week after the close in the fall of the so-called sardine canning operations. These variously prepared herring if placed on the markets would create an immediate demand. There is also a good demand for canned herring, of which a large quantity is annually imported into Canada from Britain, but possibly on account of labour conditions, the establishment of a canned herring industry on a paying basis may not be possible.

At my suggestion the Dominion government has carried out an important experiment with a view to proving that the Pacific herring are not inferior to other herring for market purposes, and with the object, no less important, of improving the method of putting up pickled herring. Earnest efforts have been made at Nanaimo and other places to establish a cured herring industry during the last five or six years. Partial success only has resulted as the pickled fish packed in most excellent barrels brought as a rule \$4 per barrel, whereas Scottish and Norwegian herring sold in the same markets for \$11 to \$12. A Scottish expert, with a staff of fisher girls who gut, select and pack the fish, and coopers who attend to the barrelling, have recently been at work and the sample shipment of Scottish-cured British Columbia herring will compare with any herring in the world. This experiment will be followed up. Already three or four enterprises, backed up with adequate capital, will embark immediately in the business on Scottish lines. There is no reason why the province should not put up as large a pack of the best herring as Scotland, which yields annually 250,000 to 350,000 tons of herring, valued, when pickled and ready for market, at no less than \$5,000,000 to \$6,000,000 per annum. The Scottish staff also prepared some superior 'kipper' and 'bloater' herring which sold at 12½c. per lb., but the preparation of kippers and well-smoked bloaters has been carried on for some time by several British Columbia firms. Certain bays and inlets on the west coast of Vancouver Island abound in excellent herring, and several lagoons in Queen Charlotte Islands swarm with immense schools, and in all these various localities herring factories are to be established. Apart from the 'pickled' herring business and the smoked herring and bloater trade a very extensive trade has grown up in dry-salted herring. In 1903 no less than 793 tons of these dry salt-cured fish were put up and shipped away by Japanese firms in British Columbia.

STURGEON.

In past times, as at present, salmon formed the staple food of the native coast tribes, but the diet was varied, on the Fraser river, by sturgeon especially in the early spring about the middle of April, or even as early as February, when these fish ascend from the sea. They frequented especially Pitt lake, 30 or 40 miles up the Fraser, and Harrison lake and river, 60 miles up the Fraser, and in the latter area Silver creek was the best fishing ground. There the Indians had been accustomed to catch quanti-

SESSIONAL PAPER No. 22

ties of sturgeon annually by means of trawls, each carrying about a dozen hooks baited with two pounds of salmon steak measuring eight or ten inches across. The spear and torch were also used. Gill-nets of stout twine were, about ten years ago, licensed by the Dominion government, and for three or four years there was quite a boom in sturgeon fishing.

Fish of enormous size were taken, some being stated to exceed 1,100 pounds in weight, while specimens ranging from 700 to 900 or 1,000 pounds were secured in numbers. The maximum catch was made in 1897, when a total amount of 1,137,696 pounds was shipped into the market, its value being not less than \$50,000, apart from the valuable caviare of which, however, British Columbia sturgeon have not been found to be very productive. The fish were not only taken when migrating up the river, but remarkably large catches were made in Pitt lake. So remunerative was the fishing that a large body of fishermen immediately engaged in it, with the result in three years the catch fell to one-fifth of the amount above stated. At the present time not more than 30,000 to 40,000 pounds of sturgeon are annually taken, or about twice the amount of the total Columbia river catch. Vast numbers of small sturgeon are seen by the Fraser river salmon fishermen, hence with the enforcement of the present Canadian regulations the fishery will, in due time, be restored.

The movements of the sturgeon appear to be erratic, for in February, 1895, when the smelt came up the Fraser, the schools of sturgeon followed them as far as Harrison lake, and then apparently satiated with food they descended again. The highest sturgeon gill-nets at that time secured the first fish, and later the nets lower down began to take sturgeon.

Oulachon are a favourite food and attract the schools of sturgeon in April, but they appear to devour other small fish, as one specimen I examined (500 pounds weight) had about a bushel of chub and small fish in its stomach. Parties affirm that such small fish are often found alive inside the sturgeon. I have also found the stomach distended with hundreds of oulachon and smelts. They mainly feed on the offal thrown out by the salmon canneries, heads and tails been greedily swallowed, but one sturgeon in October contained six fine coho salmon.

CULTUS COD, RED COD OR ROCK BASS, WHITING, ETC.

A number of edible fishes abound along the rocky shores of the province, but are chiefly used to supply the local markets. The cultus cod (*Ophiodon elongatus*) is the principal of these minor fish. It weighs from four to eight or ten pounds and is caught by means of baited hooks and drag seines. The red cod has more the features of a bass than a codfish and in California it is often called black sea bass. Its scientific name is *Sebastes mystinus* and it ranges from three pounds to ten or twelve pounds. Several other bass-like fishes are also largely sold. One species, *Sebastes pinniger*, is generally styled the red rock cod and on the table it is most excellent. The name whiting is given to a species of hake, the merluccio of southern fishermen, and technically called *Merluccius productus*, but it does not rank high although salted and cured, it is in demand, and compares well with the Atlantic hake. The hake industry is, indeed, developing rapidly.

Flat fishes of kinds most acceptable for table use abound on all parts of the Canadian coast of the Pacific, and the recent use of the otter trawl in Queen Charlotte Sound, and further north, has revealed banks crowded with splendid fish called 'plaice,' 'sole,' &c., by the fishermen. Often five tons of these fish are killed along with one ton of halibut; but there being no market for them they are usually dumped overboard, and the halibut alone retained. A demand for these fine delicately flavoured flat fish can no doubt be created and this waste of good food avoided. The experimental use of poke nets or 'sparling' nets in the Straits of Georgia this season will also lead to the capture of new food fishes and the development of new industries.

PILCHARD, ANCHOVY AND SHAD.

These three valuable species occur more or less abundantly in southern British Columbia waters. The first named is caught along with the herring on the eastern and western shores of Vancouver Island and it is said to be very numerous in Barkley Sound, and adjacent inlets. In its small immature stages it is the 'sardine' of France, and investigations on the Pacific coast would reveal the resorts of these fish, and render possible a canned sardine industry whose products could successfully compete with the greatly esteemed European product. That the true anchovy is a British Columbia fish, has long been known. I obtained specimens myself in Burrard Inlet 12 years ago, but the migrations of this valuable species are at present unknown. Once ascertained, the British Columbia anchovy could be prepared as a paste, and supply the markets, which at present are supplied by the Mediterranean. Of the shad it is unnecessary to say much. The shad caught each season by British Columbia fishermen are the result of fry planted further south by the United States Fish Commission. That the waters of the province are favourable for these fish is proved and artificial culture would aid in establishing a supply permanently, and insuring a remunerative shad fishery.

TROUT AND WHITEFISH.

Of the various species of trout (spotted or cut-throat, rainbow, Dolly Varden and lake trout) inhabiting the British Columbia rivers, the first-named is alone of any commercial moment, between 300,000 and 400,000 pounds (nearly \$40,000 in value) being annually marketed. They vary in quality in different rivers up which a great proportion of them migrate. Thus the Nimpkish spotted trout cannot be surpassed, while those of the Naas and the Fraser are much inferior.

The interior lakes and rivers furnish the purely fresh-water kinds of trout, chiefly of value for sporting purposes, but the whitefish (Williamson's whitefish *Coregonus quadrilateralis*) occurs in most waters distant from the sea, and like the large lake trout (*C. namaycush*) is netted under Dominion license. A dwarfed sockeye or red salmon also abounds in some lakes but does not descend to the sea, and is used locally for food.

SHELL-FISH.

The value of shell-fish marketed annually in the province exceeds \$50,000, but it could be easily quadrupled. The delicious small Olympia oyster occurs on every suitable shallow flat in the Straits of Georgia and around Vancouver Island, and many leases were granted by the Federal government which required the lessees to protect and cultivate the mollusks. A large species comparable to the Atlantic oyster does not occur, the alleged specimens, hitherto secured, being valueless and inedible shell-fish. In some localities, however, a large variety of the Olympia oyster occurs. Eastern oysters have been planted on many occasions, but with more or less favourable results. The valuable Abalone or ear-shell (*Haliotis*) is very plentiful in many districts, especially around Queen Charlotte Island, and considerable fisheries have been developed. Clams, of several varieties, are also fished, and there are few sandy or muddy areas where these esteemed species are not exceedingly abundant. Canneries for preserving clams are already in operation, and others in progress, so that an extensive clam industry is rapidly developing.

CRABS, SHRIMPS AND PRAWNS.

Fine crabs are universally met with on the rocky shores of the province, and in the north, especially off Queen Charlotte Islands, very large examples abound. Quantities are taken for local consumption, and during the last ten years several parties have canned small quantities, but the industry has never reached large dimensions. Prawns and shrimps are taken in all the harbours, but the true lobster does not occur, though twice the Dominion government has transplanted a quantity from the Atlantic. Occasionally the spiny-lobster or crawfish (not the fresh-water crawfish) has been taken near

SESSIONAL PAPER No. 22

Victoria. It may possibly be plentiful, but no means have been taken to create a commercial fishery for it.

WHALES.

Many species of whales occur off the British Columbia coast, both whalebone and toothed whales. Occasionally sperm whales have been noticed, four, two males and two females, having been captured by the steamer of the Sechart Whaling Station during the past twelve months, the last caught in September was a gigantic specimen yielding nearly 170 barrels of oil, but the finners and sulphur-bottoms and humpbacks and blackfish or killers are the principal kinds. Some of these monsters exceed 100 feet in length, and one was observed this fall which was estimated to reach a length of 110 feet. Hitherto the schools of whales have been of no value to the province whatever, but the action of the Dominion government, by its encouragement of whale factories on modern principles, will create in a few years a vast and remunerative industry all along the coast. A trip from Victoria to the Naas river suffices to show how plentiful these valuable creatures are, as whales may be seen 'blowing' in schools of two to twenty individuals, all the way from the Straits of Georgia, north. Numerous factory sites have already been secured, and one whaling station has commenced operations at the entrance to Barkley Sound, Vancouver Island.

Nearly 250 whales, chiefly humpbacks and sulphur bottoms, have been captured in less than a year, some months (such as September) showing a record of over 50 whales killed. One of these whales will yield on an average 50 to 80 barrels of oil, and $4\frac{1}{2}$ to 5 tons of dried guano, the oil bringing 30 to 40 cents per gallon, though the market fluctuates considerably and sperm oil is quoted at from 50 cents to 70 cents per gallon, while guano, sells at \$25 to \$30 or more per ton. If the Pacific gray whale, one of the valuable 'right' whales, still survives in British Columbia waters, though exterminated some years ago off the California coast, an excessively remunerative industry is certain to grow rapidly. As it is, the whales, known to exist, furnish numerous important products when treated by the most recent mechanical and chemical methods. Oil, fertilizer, leather, glue, canned 'beef,' which is really prepared whale-flesh put up in beef cans, and even condensed milk from the female whale, are among the articles yielded by these creatures.

Pickled whales' tails are regarded with favour in Japan, and the large tail flukes, salted, have been shipped from Sechart, 40 barrels of them being sent about the middle of September.

The New York *Fishing Gazette* (Sept. 22, 1906) says of the whale meat market in the Orient:—Most of the whale meat consumed in Japan comes from Korea. The supply is limited and prices rule fairly high. It is consequently probable that before long British Columbia, where the catch is so great that whale flesh is even used as manure, may attempt to supply the Japan market with part of its enormous surplus. The idea seems a feasible one, reports the British consul at Nagasaki, though whaling is rapidly developing on modern lines in Japan, seven Norwegian whale steamers being already at work in Korea and north-east Japan, the industry only extending along those shores within the last twelve months. With the establishment of stations on the Japanese eastern coast the fleets are being augmented. It has been found that one steam whaler is sufficient to feed a single station, and when two new steamers from Christiania—the *Lightning* and the *Thunder*—reach their destination there will be in all nine stations—five on the Korean coast and four on the northeastern coast of Japan, the best whaling stations being off Sendai to the further north. The station to which Captain Oleson has been attached is at Chusai, 140 miles north of Yokohama. The harbours are poor in that locality, and it is necessary to tow the whalers brought in up the river by sampans to the stations. The whales, too, are more wary than those in British Columbia waters, which have not yet been so sharply hunted. Here on the Pacific coast harpoons can be fired from as near as seven or eight fathoms from the whale. In Japanese waters it is frequently necessary to shoot from 35 fathoms distance, with much less chance of killing the whale. Yet, as an evidence of the success of these new whaling ventures, one steamer in 1905 secured no less than 154 sulphur bottom whales

6-7 EDWARD VII., A. 1907

in the Japanese waters referred to. Whalebone, ambergris, spermaceti and similar materials, will also add to the substantial profits which the newly organized whaling companies will without doubt secure.

DOGFISH, RATFISH, ETC.

For over twenty years oil from these fishes has been prepared in a desultory manner, at two or three "oileries" at Skidegate, Queen Charlotte Island, and other places, but several projects are now on foot for fully utilizing, as guano, fish-glue, etc., other products yielded by the sharks, dogfish and ratfish. The oil of the ratfish is especially valuable medicinally, and for preserving firearms, and the most recent extracting and cooking and drying machinery is being adopted, so that the present value of fish oil in the province, viz., about \$100,000, will be doubled or trebled without difficulty. The canning of dogfish has been successfully tried in eastern Canada this year and the flesh when properly packed is by no means to be despised.

FISH OFFAL.

The fish waste from the canneries and halibut fisheries, has hitherto been practically unutilized. Several fish fertilizer factories have operated on the Fraser river and further north, but the immense quantity of 'gurry' annually produced has never been effectively treated. More than 1,000 tons of fish guano are produced, at present, each season, valued at nearly \$32,000. The Dominion government last year voted \$10,000 as a guarantee to parties against loss, if the Fraser river offal were utilized by them, and the development of guano production on a large scale is being carried out at the present time. Certain Japanese and other firms captured herring in immense quantities, but as the use of food fish for manure is discouraged in Canada that branch of the fertilizer industry collapsed a year ago. The herring taken at Nanaimo for guano sold for \$3.50 per ton f. o. b. on the scows, whereas the same quantity of fresh herring, cured and barrelled for the pickled fish markets, would realize \$40 to \$80 or even \$100 per ton. Apart from herring, there remain vast quantities of non edible fish and much fish offal, which offer an opportunity by modern mechanical methods of successful exploitation.

In this brief and hasty review of the various lines, upon which the fishing industries of the Pacific waters of the Dominion are pursued, no reference is made to the sealing, sea otter, and similar marine industries, partly because they are not strictly speaking, fishing enterprises at all and partly because, as compared with the salmon, halibut, herring, and other industries, they are of much inferior value. In the total value of the British Columbia fishing industries (nearly \$9,850,000) they show a value in 1905 of about \$331,152. The signs of rapid development, as indicated in the foregoing sketch are unmistakable and in a very few years the British Columbia fisheries should double their present annual money returns.

APPENDIX No. 1.

FISHING BOUNTIES.

The payments made for this service are under the authority of Act 54-55 Vic., cap. 42, intituled : 'An Act to encourage the development of the sea fisheries and the building of fishing vessels,' which provides for the payment of the sum of \$160,000 annually, under regulations to be made from time to time by the Governor General in Council.

REGULATIONS.

The regulations governing the payment of fishing bounties are as established by the following Order in Council, dated December 10, 1897 :—

Order in Council.

AT THE GOVERNMENT HOUSE AT OTTAWA,

FRIDAY, the 10th day of December, 1897.

Present :

HIS EXCELLENCY THE GOVERNOR GENERAL IN COUNCIL.

His Excellency, in virtue of the provisions of 'The Bounty Act, 1891', 54-55 Victoria, chapter 42, and by and with the advice of the Queen's Privy Council for Canada, is pleased to order that the regulations governing the payment of fishing bounties established by order of the Governor in Council, dated the 24th August, 1894, shall be and the same are hereby rescinded, and the following regulations substituted therefor :—

1. Resident Canadian fishermen who have been engaged in deep sea fishing for fish other than shell-fish, salmon and shad, or fish taken in rivers, or mouths of rivers, for at least three months, and have caught not less than 2,500 pounds of sea-fish shall be entitled to a bounty ; provided always, that no bounty shall be paid to men fishing in boats measuring less than 13 feet keel, and not more than 3 men (the owner included), will be allowed as claimants in boats under 20 feet.

2. No bounty shall be paid upon fish caught in trap-nets, pound-nets and weirs, nor upon the fish caught in gill-nets fished by persons who are pursuing other occupations than fishing, and who devote merely an hour or two daily to fishing these nets but are not, as fishermen, steadily engaged in fishing.

3. Only one claim will be allowed in each season, even though the claimant may have fished in two vessels, or in a vessel and a boat, or in two boats.

4. The owners of boats measuring not less than 13 feet keel which have been engaged during a period of not less than three months in deep-sea fishing for fish other than shell-fish, salmon or shad, or fish taken in rivers or mouths of rivers, shall be entitled to a bounty on each such boat.

5. Canadian registered vessels, owned and fitted out in Canada, of 10 tons and upwards (up to 80 tons) which have been exclusively engaged during a period of not less than three months in the catch of sea-fish other than shell-fish, salmon or shad, or fish

6-7 EDWARD VII., A. 1907

taken in rivers, or mouths of rivers, shall be entitled to a bounty to be calculated on the registered tonnage which shall be paid to the owner or owners.

6. The three months during which a vessel must have been engaged in fishing, to be entitled to bounty, shall commence on the day the vessel sails from port on her fishing voyage and end the day she returns to port from said voyage.

7. Owners or masters of vessels intending to fish and claim bounty on their vessels must, before proceeding on a fishing voyage, procure a license from the nearest Collector of Customs or Fishery Overseer, said license to be attached to the claim when sent in for payment.

8. Dates and localities of fishing must be stated in the claim, as well as the quantity and kinds of sea-fish caught.

9. Ages of men must be given. Boys under 14 years of age are not eligible as claimants.

10. Claims must be sworn to as true and correct in all their particulars.

11. Claims must be filed on or before November 30 in each year.

12. Officers authorized to receive claims will supply the requisite blanks free of charge, and after certifying the same will transmit them to the Department of Marine and Fisheries.

13. No claim in which an error has been made by the claimant or claimants shall be amended after it has been signed and sworn to as correct.

14. Any person or persons detected making returns that are false or fraudulent in any particular will be debarred from any further participation in the bounty, and be prosecuted according to the utmost rigour of the law.

15. The amount of the bounty to be paid to fishermen and owners of boats and vessels will be fixed from time to time by the Governor in Council.

16. All vessels fishing under bounty license are required to carry a distinguishing flag, which must be shown at all times during the fishing voyage at the main-topmast head. The flag must be four feet square in equal parts of red and white, joined diagonally from corner to corner. Any case of neglect to carry out this regulation reported to the Department of Marine and Fisheries will entail the loss of the bounty, unless satisfactory reasons are given for its non-compliance.

JOHN J. McGEE,

Clerk of the Privy Council.

The bounty for the year 1905 was distributed on the basis authorized by the following Order in Council, approved by the Governor General on the 26th January, 1906.

On a Memorandum dated 20th January, 1906, from the Acting Minister of Marine and Fisheries, recommending that the sum of one hundred and sixty thousand dollars, payable under the provisions of the Act 54-55 Victoria, cap. 42, intituled: 'An Act to amend chapter 96 of the Revised Statutes, intituled: "An Act to encourage the development of the Sea Fisheries and the building of fishing vessels,"' be distributed for the year 1905-1906 upon the following basis:—

Vessels: The owners of the vessels entitled to receive bounty shall be paid one dollar (\$1) per registered ton, provided, however, that the payment to the owner of any one vessel shall not exceed the sum of eighty dollars (\$80), and all vessel fishermen entitled to receive bounty shall be paid the sum of seven dollars and ten cents (\$7.10) each.

Boats: Fishermen engaged in fishing in boats, who shall also have complied with the regulations entitling them to receive the bounty, shall be paid the sum of three dollars and sixty-five cents (\$3.65) each, and the owners of fishing boats shall be paid one dollar (\$1) per boat.

JOHN J. McGEE,

Clerk of the Privy Council.

SESSIONAL PAPER No. 22

There were received for the year 1905, 13,186 claims, an increase of 435 as compared with 1904.

The number of claims paid during the year was 13,141, an increase of 470 as compared with the previous year.

There were \$71,502 in bounties paid to vessels and their crews, and \$87,044.65 to boats and boat fishermen, making the total payments during the year 1905, \$158,546.65.

The number of vessels which received bounty during the year was 922, the total tonnage being 25,686 tons, an increase of 68 vessels and a decrease of 4 tons.

During the year bounty was paid on 12,219 boats and to 20,501 boat fishermen, being an increase of 402 boats and 423 men as compared with 1904.

DETAILED STATEMENT of Fishing Bounty Claims received and paid during the year 1905.

Province.	County.	NUMBER OF CLAIMS.		
		Received.	Rejected and held in Abeyance.	Paid.
Nova Scotia.....	Annapolis.....	155		155
	Antigonish.....	124		124
	Cape Breton.....	470	3	467
	Cumberland.....	3		3
	Digby.....	509		509
	Guysborough.....	1,021	2	1,019
	Halifax.....	1,290	4	1,286
	Hants.....	1		1
	Inverness.....	364		364
	King's.....	49	1	48
	Lunenburg.....	916	2	914
	Pictou.....	13		13
	Queen's.....	140		140
	Richmond.....	767	3	764
	Shelburne.....	614		614
	Victoria.....	380	1	379
	Yarmouth.....	218		218
	Totals.....	7,034	16	7,018
New Brunswick.....	Charlotte.....	395	3	392
	Gloucester.....	394	5	389
	Kent.....	49		49
	Northumberland.....	8		8
	Restigouche.....	1		1
	St. John.....	34		34
	Totals.....	881	8	873
Prince Edward Island.....	King's.....	512		512
	Prince.....	302		302
	Queen's.....	107		107
	Totals.....	921		921
Quebec.....	Bonaventure.....	853		853
	Gaspé.....	2,556	16	2,540
	Rimouski.....	113	4	109
	Saguenay.....	828	1	827
	Totals.....	4,350	21	4,329
Grand totals.....		13,186	45	13,141

6-7 EDWARD VII., A. 1907

DETAILED STATEMENT of Fishing Bounties paid to Vessels in each County during the
Year 1905.

Province.	County.	Number of Vessels.	Tonnage.	Average Tonnage.	Number of Men.	Amount paid.
						\$ cts.
Nova Scotia	Annapolis.....	9	179	19·89	49	526 90
	Antigonish.....	1	17	17·00	4	45 40
	Cape Breton.....	14	232	16·57	58	643 80
	Cumberland.....	2	31	15·50	5	66 50
	Digby.....	53	1,340	25·28	396	4,144 15
	Guysborough.....	61	1,113	18·24	308	3,299 80
	Halifax.....	69	1,671	24·21	445	4,830 50
	Hants.....					
	Inverness.....	27	372	13·41	139	1,358 90
	King's.....	2	38	19·00	6	80 60
	Lunenburg.....	157	11,336	72·20	2,479	28,936 90
	Pictou.....	1	16	16·00	3	37 30
	Queen's.....	8	176	22·00	45	495 50
	Richmond.....	61	1,427	23·39	377	4,103 70
	Shelburne.....	93	1,759	18·91	508	5,365 80
	Victoria.....	8	92	11·50	35	340 50
	Yarmouth.....	54	1,441	26·68	381	4,146 10
	Totals.....	620	21,240	34·25	5,238	58,422 35
New Brunswick.....	Charlotte.....	44	771	17·52	164	1,935 40
	Gloucester.....	204	2,519	12·34	812	8,284 25
	Kent.....					
	Northumberland.....	5	84	16·80	17	204 70
	Restigouche.....	1	26	26·00	4	54 40
	St. John.....	10	200	20·00	38	469 80
	Totals.....	264	3,600	13·63	1,035	10,948 55
Prince Edward Island.	King's.....	16	357	22·31	69	846 90
	Prince.....	7	153	21·85	33	387 30
	Queen's.....	5	77	15·40	23	240 30
	Totals.....	28	587	20·96	125	1,474 50
Quebec.....	Bonaventure.....					
	Gaspé.....	7	123	17·57	35	371 50
	Rimouski.....					
	Saguenay.....	3	136	45·33	21	285 10
	Totals.....	10	259	25·90	56	656 60
	Grand totals.....	922	25,686	27·85	6,454	71,502

SESSIONAL PAPER No. 22

DETAILED STATEMENT of Fishing Bounties paid to Boats in each County during the Year 1905, showing also total amount paid to Vessels and Boats for the Year.

Province.	County.	Number of Boats.	Number of Men.	Amount paid.	Total Bounty paid to Vessels and Boats in 1905.
				\$ cts.	\$ cts.
Nova Scotia	Annapolis.....	146	231	989 15	1,516 05
	Antigonish.....	123	176	765 40	810 80
	Cape Breton.....	453	811	3,413 95	4,057 75
	Cumberland.....	1	2	8 30	74 80
	Digby.....	456	823	3,452 65	7,596 80
	Guysborough.....	958	1,526	6,527 90	9,827 70
	Halifax.....	1,217	1,643	7,213 95	12,044 45
	Hants.....	1	1	4 65	4 65
	Inverness.....	337	622	2,607 30	3,966 20
	King's.....	46	65	283 25	363 85
	Lunenburg.....	757	904	4,066 60	32,993 50
	Pictou.....	12	15	66 75	104 50
	Queen's.....	132	212	905 80	1,401 30
	Richmond.....	703	1,101	4,721 85	8,825 55
	Shelburne.....	521	874	3,711 10	9,346 90
	Victoria.....	371	561	2,418 65	2,759 15
	Yarmouth.....	164	255	1,094 75	5,240 85
	Totals.....	6,398	9,822	42,242 00	100,664 35
New Brunswick.....	Charlotte.....	348	490	2,136 50	4,071 90
	Gloucester.....	185	435	1,773 15	10,057 40
	Kent.....	49	78	333 70	333 70
	Northumberland.....	3	6	24 90	229 60
	Restigouche.....				54 40
	St. John.....	24	38	162 70	632 50
	Totals.....	609	1,047	4,430 95	15,379 50
Prince Edward Island.....	King's.....	496	783	3,354 15	4,201 05
	Prince.....	295	620	2,558 00	2,945 30
	Queen's.....	102	227	930 55	1,170 85
	Totals.....	893	1,630	6,842 70	8,317 20
Quebec.....	Bonaventure.....	853	1,487	6,280 55	6,280 55
	Gaspé.....	2,533	4,937	20,553 75	20,925 25
	Rimouski.....	109	161	696 65	696 65
	Saguenay.....	824	1,417	5,998 05	6,283 15
	Totals.....	4,319	8,002	33,529 00	34,185 60
	Grand totals	12,219	20,501	87,044 65	158,546 65

GENERAL STATISTICS.

The fishing bounty was first paid in 1882.

The payments were made each year on the following basis :—

1882, vessels \$2 per ton, one half to the owner and the other half to the crew.
Boats at the rate of \$5 per man, one-fifth to the owner and four-fifths to the men.
1883, vessels \$2 per ton, and boats \$2.50 per man, distributed as in 1882.
1884, vessels \$2 per ton, as in 1882 and 1883.

Boats from 14 to 18 feet keel.	\$1 00
“ 18 to 25 “	1 50
“ 25 feet keel upwards.....	2 00
Boat fishermen.....	3 00

1885, 1886 and 1887, vessels \$2 per ton as in previous years. Boats measuring 13 feet keel having been admitted in 1885, the rates were :—Boats from 13 to 18 feet keel, \$1; from 18 to 25 feet keel, \$1.50; from 25 feet keel upwards, \$2, and fishermen \$3 each.

1888, vessels \$1.50 per ton, one-half each to owner and crew. Boats, the same as 1885, 1886 and 1887.

1889, 1890 and 1891, vessels \$1.50 per ton as in 1888. Boats \$1 each. Boat fishermen \$3.

1892, vessels \$3 per ton, one-half each to owner and crew. Boats \$1 each. Boat fishermen \$3.

1893, vessels \$2.90 per ton, paid as formerly. Boats \$1 each. Boat fishermen \$3.

1894, vessels \$2.70 per ton, distributed as in previous years. Boats \$1 each. Boat fishermen \$3.

1895, vessels \$2.60 per ton, half each to owner and crew. Boats \$1 each. Boat fishermen \$3.

1896, vessels \$1 per ton, which was paid to the owners, and vessel fishermen \$5 each, clause No. 5 of the regulation having been amended accordingly. Boats \$1 each, and boat fishermen \$3.50 per man.

1897, vessels \$1 per ton, and vessel fishermen \$6 each. Boats \$1 each, and boat fishermen \$3.50 per man.

1898, vessels \$1 per ton, and vessel fishermen \$6.50 each. Boats \$1 each, and boat fishermen \$3.50 per man.

1899, vessels \$1 per ton, and vessel fishermen \$7 each. Boats \$1 each, and boat fishermen \$3.50 per man.

1900, vessels, \$1 per ton, and vessel fishermen \$6.50 each. Boats \$1 each, and boat fishermen \$3.50 per man.

1901, vessels \$1 per ton, and vessel fishermen \$7 each. Boats \$1 each, and boat fishermen \$3.50 per man.

1902, vessels \$1 per ton, and vessel fishermen, \$7.25 each. Boats \$1 each, and boat fishermen \$3.80 per man.

1903, vessels \$1 per ton, and vessel fishermen \$7.30 each. Boats \$1 each, and boat fishermen \$3.90 per man.

1904, vessels \$1 per ton, and vessel fishermen \$7.15 each. Boats \$1 each, and boat fishermen \$3.75 per man.

1905, vessels \$1 per ton, and vessel fishermen \$7.10 each. Boats \$1 each and boat fishermen \$3.65 per man.

Since 1882, 19,653 vessels, totalling a tonnage of 685,030 tons, have received the bounty. The total number of vessel fishermen which received bounty is 149,869, being an average of about 7 men per vessel.

The total number of boats to which bounty was paid since 1882 is 324,256, and the number of fishermen 592,155. Average number of men per boat 2.

The highest bounty paid per head to vessel fishermen was \$21.75 in 1893; the lowest 83 cents, while the highest to boat fishermen was \$4, the lowest \$2.

The general average paid per head is \$5.11.

SESSIONAL PAPER No. 22

COMPARATIVE STATEMENT by Provinces for the Years 1882 to 1905, inclusive, showing :—
 (1) Total number of Fishing Bounty Claims received and paid by the Department of Marine and Fisheries.

YEAR.	NOVA SCOTIA.		NEW BRUNSWICK.		P. E. ISLAND.		QUEBEC.		TOTAL.	
	Received.	Paid.	Received.	Paid.	Received.	Paid.	Received.	Paid.	Received.	Paid.
1882...	6,730	6,613	1,257	1,142	1,169	1,100	3,162	3,117	12,318	11,972
1883...	7,171	7,076	1,693	1,579	1,138	1,106	3,602	3,325	13,604	13,086
1884...	7,007	6,930	1,252	1,224	923	885	3,470	3,429	12,652	12,468
1885...	7,646	7,599	1,609	1,588	1,117	1,025	3,943	3,912	14,315	14,124
1886...	7,639	7,702	1,767	1,763	1,131	1,080	4,275	4,355	14,812	14,900
1887...	8,262	8,227	1,975	1,958	1,201	1,126	4,138	4,105	15,576	15,416
1888...	8,481	8,429	2,065	2,026	1,153	834	4,328	4,310	16,027	15,599
1889...	8,816	8,523	2,428	2,392	1,211	1,511	4,664	4,652	17,119	17,078
1890...	9,337	9,429	2,522	2,469	1,352	1,257	4,860	4,804	18,071	17,959
1891...	10,242	10,063	2,831	2,084	1,482	1,446	5,108	4,913	19,663	18,506
1892...	8,272	8,186	1,067	1,001	1,065	1,051	4,425	4,204	14,829	14,442
1893...	7,926	7,844	967	881	1,027	1,012	4,059	3,898	13,979	13,635
1894...	8,640	8,600	925	911	983	963	3,948	3,876	14,496	14,350
1895...	8,835	8,825	979	975	1,009	1,025	3,904	3,955	14,727	14,780
1896...	8,597	8,562	1,137	1,064	1,111	1,120	4,366	4,229	15,211	14,975
1897...	8,450	8,418	1,042	991	1,175	1,171	4,180	4,149	14,847	14,729
1898...	8,446	8,347	934	917	1,143	1,145	4,156	4,092	14,679	14,501
1899...	7,894	7,754	849	825	1,016	947	4,134	4,102	13,893	13,628
1900...	7,484	7,452	904	904	1,119	1,169	4,264	4,251	13,771	13,776
1901...	7,346	7,344	829	826	941	937	4,277	4,267	13,393	13,374
1902...	6,710	6,671	802	794	913	912	4,371	4,346	12,796	12,723
1903...	6,297	6,284	832	830	978	974	4,110	4,090	12,217	12,178
1904...	6,750	6,732	879	866	1,027	994	4,095	4,079	12,751	12,671
1905...	7,034	7,018	881	873	921	921	4,350	4,329	13,186	13,141
Total.	190,012	188,628	32,426	30,883	26,305	25,711	100,189	98,789	348,932	344,011

6-7 EDWARD VII., A. 1907

(2) NUMBER of vessels, tonnage and number of men which received Bounty in each year.

YEAR.	NOVA SCOTIA.			NEW BRUNSWICK.			P. E. ISLAND.			QUEBEC.			TOTAL.		
	No. of Vessels.	Tonnage.	No. of Men.	No. of Vessels.	Tonnage.	No. of Men.	No. of Vessels.	Tonnage.	No. of Men.	No. of Vessels.	Tonnage.	No. of Men.	No. of Vessels.	Tonnage.	No. of Men.
1882....	588	22,841	5,343	120	2,171	531	15	389	74	63	2,210	538	786	27,611	6,486
1883....	700	29,788	6,238	126	2,102	496	16	450	66	62	2,236	443	904	34,576	7,243
1884....	700	29,828	6,327	139	2,289	560	16	582	92	56	1,965	382	911	34,664	7,361
1885....	629	27,709	5,897	128	2,120	496	19	597	113	55	1,791	317	831	32,217	6,823
1886....	562	25,375	5,022	145	2,628	520	32	1,071	215	52	1,730	320	791	30,804	6,077
1887....	566	24,520	4,900	154	2,889	563	38	1,677	338	54	1,883	334	812	30,969	6,135
1888....	589	26,008	5,450	150	2,545	544	37	1,245	249	51	1,842	388	827	31,640	6,631
1889....	597	27,123	5,684	153	2,590	565	35	1,274	239	48	1,729	330	833	32,716	6,818
1890....	540	23,955	4,935	133	2,129	447	32	1,002	203	34	1,182	220	739	28,268	5,805
1891....	527	22,780	4,618	124	2,051	411	27	778	155	27	924	168	705	26,533	5,352
1892....	507	22,279	4,611	108	1,683	343	30	983	139	23	803	159	668	25,748	5,252
1893....	536	23,195	4,780	210	2,922	634	27	910	151	32	952	179	805	27,979	5,744
1894....	602	24,735	5,077	238	3,189	721	21	594	114	38	1,066	178	899	29,584	6,090
1895....	603	25,018	5,184	238	3,107	764	27	769	129	39	1,262	173	907	30,156	6,250
1896....	553	23,415	4,607	250	3,337	800	23	656	114	36	1,143	144	862	28,551	5,665
1897....	507	21,323	4,829	239	3,079	816	20	490	109	24	833	116	790	25,725	5,870
1898....	505	20,868	4,840	239	3,155	859	24	561	125	16	524	77	784	25,108	5,901
1899....	519	22,538	5,323	238	3,131	885	15	373	76	17	497	78	789	26,539	6,362
1900....	525	22,474	5,352	234	2,969	890	29	737	153	14	459	76	802	26,639	6,471
1901....	508	21,469	5,158	242	3,229	872	23	541	115	13	366	69	786	25,605	6,214
1902..	505	21,248	5,126	249	3,293	972	28	630	135	13	350	51	795	25,521	6,284
1903....	546	21,992	5,173	259	3,454	971	36	765	169	10	290	48	851	26,501	6,361
1904....	552	21,285	5,040	257	3,429	981	30	594	126	15	382	73	854	25,690	6,220
1905....	620	21,240	5,238	264	3,600	1,035	28	587	125	10	259	56	922	25,686	6,454
Total...	13,586	573,006	124,752	4,637	67,091	16,676	628	18,255	3,524	802	26,678	4,917	19,653	685,030	149,869

SESSIONAL PAPER No. 22

(3) NUMBER of Boats and boat fishermen which received Bounty in each year.

YEAR.	NOVA SCOTIA.		NEW BRUNSWICK.		P. E. ISLAND.		QUEBEC.		TOTAL.	
	No. of Boats.	No. of Men.	No. of Boats.	No. of Men.	No. of Boats.	No. of Men.	No. of Boats.	No. of Men.	No. of Boats.	No. of Men.
1882	6,043	12,130	1,024	2,530	1,087	3,070	3,071	5,716	11,225	23,446
1883	6,458	13,553	1,453	3,309	1,098	3,106	3,266	6,188	12,275	26,156
1884	6,257	12,669	1,086	2,505	869	2,346	3,344	6,416	11,556	23,936
1885	6,970	13,396	1,460	3,254	1,006	2,606	3,857	7,485	13,293	26,741
1886	7,140	13,351	1,618	3,567	1,048	2,547	4,303	7,981	14,109	27,446
1887	7,662	13,997	1,804	3,994	1,088	2,711	4,051	7,550	14,605	28,252
1888	7,840	14,115	1,876	4,148	797	2,141	4,259	7,852	14,772	28,256
1889	7,926	14,118	2,237	5,032	1,475	3,568	4,602	8,807	16,240	31,525
1890	8,886	15,738	2,324	5,242	1,192	3,024	4,766	9,241	17,168	33,245
1891	9,525	16,552	1,928	4,126	1,383	3,427	4,865	9,402	17,701	33,507
1892	7,679	12,307	893	1,765	1,021	2,047	4,181	7,693	13,774	23,812
1893	7,308	11,748	671	1,314	985	1,962	3,866	7,245	12,830	22,269
1894	7,956	12,899	661	1,281	913	1,813	3,821	7,139	13,351	23,132
1895	8,222	13,106	737	1,434	998	2,141	3,916	7,877	13,873	24,558
1896	8,008	12,454	814	1,553	1,095	2,126	4,189	7,688	14,106	23,821
1897	7,911	12,542	752	1,351	1,151	2,147	4,125	7,572	13,939	23,612
1898	7,872	12,438	678	1,237	1,121	2,199	4,076	7,627	13,747	23,501
1899	7,235	11,305	587	1,027	932	1,710	4,085	7,696	12,839	21,738
1900	6,927	10,645	670	1,184	1,140	2,198	4,237	8,004	12,974	22,031
1901	6,836	10,464	584	1,001	914	1,735	4,254	8,017	12,588	21,217
1902	6,166	9,442	545	966	884	1,638	4,333	8,180	11,928	20,226
1903	5,738	8,775	571	964	938	1,722	4,080	7,688	11,327	19,149
1904	6,180	9,556	609	1,082	964	1,792	4,064	7,648	11,817	20,078
1905	6,398	9,822	609	1,047	893	1,630	4,319	8,002	12,219	20,501
Total	173,143	297,122	26,191	54,913	24,992	55,406	97,930	184,714	324,256	592,155

6-7 EDWARD VII., A. 1907

(4) TOTAL Number of men receiving Bounty in each year.

YEAR.	NOVA SCOTIA.	NEW BRUNSWICK.	P. E. ISLAND.	QUEBEC.	TOTAL.
	No. of Men.	No. of Men.	No. of Men.	No. of Men.	
1882.....	17,473	3,061	3,144	6,254	29,932
1883.....	19,791	3,805	3,172	6,631	33,399
1884.....	18,996	3,065	2,438	6,798	31,297
1885.....	19,293	3,750	2,719	7,802	33,564
1886.....	18,373	4,087	2,762	8,301	33,523
1887.....	18,897	4,557	3,049	7,884	34,387
1888.....	19,565	4,692	2,390	8,240	34,887
1889.....	19,802	5,597	3,807	9,137	38,343
1890.....	20,673	5,689	3,227	9,461	39,050
1891.....	21,170	4,537	3,582	9,570	38,859
1892.....	16,918	2,108	2,186	7,852	29,064
1893.....	16,528	1,948	2,113	7,424	28,013
1894.....	17,976	2,002	1,927	7,317	29,222
1895.....	18,290	2,198	2,270	8,050	30,808
1896.....	17,061	2,353	2,240	7,832	29,486
1897.....	17,371	2,167	2,256	7,688	29,482
1898.....	17,278	2,096	2,324	7,704	29,402
1899.....	16,628	1,912	1,786	7,774	28,100
1900.....	15,997	2,074	2,351	8,080	28,502
1901.....	15,622	1,873	1,850	8,086	27,431
1902.....	14,568	1,938	1,773	8,231	26,510
1903.....	13,948	1,935	1,891	7,736	25,510
1904.....	14,596	2,063	1,918	7,721	26,298
1905.....	15,060	2,082	1,755	8,058	26,955
Total.....	421,874	71,589	58,930	189,631	742,024

SESSIONAL PAPER No. 22

(5) TOTAL annual payments of Fishing Bounty.

YEAR.	Nova Scotia.	New Brunswick.	P. E. Island.	Quebec.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1882.....	106,098 72	16,997 00	16,137 00	33,052 75	172,285 47
1883.....	89,432 50	12,395 20	8,577 14	19,940 01	130,344 85
1884.....	104,934 09	13,576 00	9,203 96	28,004 93	155,718 98
1885.....	103,999 73	15,908 25	10,166 65	31,464 76	161,539 39
1886	98,789 54	17,894 57	10,935 87	33,283 61	160,903 59
1887.....	99,622 03	19,699 65	12,528 51	31,907 73	163,757 92
1888	89,778 90	18,454 92	9,092 96	32,858 75	150,185 53
1889.....	90,142 51	21,026 79	13,994 53	33,362 71	158,526 54
1890	91,235 64	21,108 33	11,686 32	34,210 72	158,241 01
1891.....	92,377 42	17,235 96	12,771 30	34,507 17	156,891 85
1892.....	109,410 39	10,864 61	9,782 79	29,694 35	159,752 14
1893	108,060 67	12,524 09	9,328 62	28,320 72	158,234 10
1894	111,460 03	12,690 80	7,875 79	28,040 18	160,066 80
1895.....	110,765 27	12,919 32	9,285 13	30,598 27	163,567 99
1896.....	98,048 95	13,602 88	9,745 50	32,992 44	154,389 77
1897.....	102,083 50	13,454 50	9,809 00	32,157 00	157,504 00
1898	103,730 00	13,746 00	10,188 00	31,795 00	159,459 00
1899	106,598 50	13,514 50	7,822 00	32,065 00	160,000 00
1900.....	101,448 00	13,562 50	10,589 00	33,203 00	158,802 50
1901.....	101,024 50	13,420 50	8,335 50	33,161 50	155,942 00
1902.....	100,455 70	14,555 80	8,716 55	36,125 45	159,853 50
1903.....	99,714 15	14,872 75	9,652 50	34,704 30	158,943 70
1904.....	99,286 44	15,110 80	9,179 35	33,651 65	157,228 24
1905.....	100,664 35	15,379 50	8,317 20	34,185 60	158,546 65
Total..	2,419,161 53	364,515 22	243,721 17	763,287 60	3,790,685 52

6-7 EDWARD VII., A. 1907

List of Vessels which received Fishing Bounty during the Year 1905-06.

PROVINCE OF NOVA SCOTIA.

ANNAPOLIS COUNTY.

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts.
80093	Anna K.	St. John	14	Edward Fales.	Margaretville. . .	1	21 10
103066	Eddie J.	Yarmouth	22	David Hayden	Thorne's Cove ..	10	93 00
107478	Jessie C.	Digby	10	W. H. Sabean	Port Lorne. ....	...	10 00
111998	Jessie K.	Annapolis	11	Norman Gregory. . .	Parker's Cove. . .	4	39 40
83461	Josie L. Day	Digby	16	Bernard Longmire. . .	Hilsburn	7	65 70
85334	Lloyd	Yarmouth	31	W. H. Anderson. . .	Parker's Cove. . .	11	109 10
100539	Rowena.	Digby	10	John F. Peters.	Litchfield.	3	31 10
107293	S. C. H.	Annapolis.	49	John S. Hayden	Victoria Beach. . .	11	127 10
116233	Wild Rose.	Digby	16	Lewis Sabean.	Port Lorne.	2	30 20

ANTIGONISH COUNTY.

103542	Emma Brow.	Halifax	17	J. J. Brow.	H'r'b'r au Bouché	4	45 40
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CAPE BRETON COUNTY.

112376	Agnes.	Arichat.	15	Patrick Wadden	Scatarie	4	43 40
100846	Albatross.	Lunenburg	26	John Arsenault	Alder Point ...	7	75 70
100389	Annie F.	Sydney	13	John Farrell	Main à Dieu.	3	34 30
100372	Betsy Jane.	"	11	Samuel Moore	Little Bras d'Or. .	5	46 50
85381	Champion.	"	19	Jno. Williams	Louisburg	5	54 50
90834	Diego.	Port Medway. . .	27	Thos. Peach	Port Morien.	7	76 70
75571	Fanny.	Liverpool	16	Harry Annesty	North Sydney ..	2	30 20
103412	Minnie B.	Lunenburg	25	W. T. Eastman.	"	3	46 30
107375	Minnie B.	Sydney	10	Jacob Rogers.	"	3	31 30
107360	Ovando.	"	11	Patrick Campbell. . .	Main à Dieu.	2	25 20
100566	Rob S.	Halifax	21	Gilbert Tutty.	Big Lorraine.	4	49 40
107376	Rozzie.	Sydney	17	Robt. Fudge.	North Sydney ..	4	45 40
107359	Victoria.	"	11	James Gibbs.	Big Lorraine.	4	39 40
107351	Wilfrid Laurier. .	"	10	Philip May.	North Sydney ..	3	31 30

CUMBERLAND COUNTY.

77786	Hesperus.	Halifax	17	Riley Lewis	Apple Riv. West	2	31 20
103593	Jessie & Ada	Charlottetown. .	14	Geo. Heather.	Pugwash.	3	35 30

DIGBY COUNTY.

107476	Addie B.	Digby	13	A. Thompson.	Westport.	6	55 60
112286	A. E. Moore	"	11	A. R. Bailey.	"	4	39 40
111528	Alart.	"	11	B. Doucette	Mavillette	4	39 40
116235	Aleyone.	"	52	Howard Anderson ..	Digby.	13	144 30
107807	America	St. John.	16	Reuben Thurber.	Freeport.	5	51 50
111524	Annie Laurie.	Digby.	10	Robt. Percy	"	3	31 30
90655	Annina.	Yarmouth.	12	Stephen Haynes	Digby.	5	47 50
112102	Ariadne.	St. John.	48	H. Outhouse.	Tiverton.	13	140 30
100547	B. and C.	Digby.	14	Edwin Hains.	Freeport.	5	49 50
100813	Blanche.	Barrington	23	D. Outhouse.	Tiverton.	9	86 90
111897	Burque Brothers. .	Weymouth	10	P. Burque.	Church Point. . .	5	45 50
111898	Catherine.	"	11	Mede Balliveau	Grosses Coques ..	4	39 40
74331	Condor.	Yarmouth.	11	Howard Titus.	Westport.	4	39 40
116236	Cora May	Digby.	64	Chas. E. Finigan.	Freeport.	16	177 60

SESSIONAL PAPER No. 22

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*DIGBY COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
103181	Curlew.....	Digby.....	63	Geo. Denton.....	Westport.....	19	197 90
107112	Daisy Linden.....	".....	97	David Sproule.....	Digby.....	5	115 50
116239	Edna L.....	".....	11	K. H. A. Lewis.....	Rossway.....	2	25 20
77740	Elmer.....	".....	15	Wm. Ross.....	Digby.....	8	71 80
103749	Emerald.....	".....	29	Edward Keans.....	".....	12	114 20
116446	Emerson Faye.....	Shelburne.....	47	Milton Hains.....	Freeport.....	14	146 40
121657	Emily C.....	Yarmouth.....	11	Nicholas Comeau.....	Meteghan.....	4	39 40
107604	Emma D.....	Weymouth.....	20	F. S. Doucette.....	Mavillette.....	6	62 60
111527	Etta H.....	Digby.....	10	Jas. Buckman.....	Westport.....	3	31 30
112281	Eveline.....	".....	22	Geo. Trahan.....	Meteghan.....	5	57 50
74329	Fairy Queen.....	Yarmouth.....	13	Wallace Coggins.....	Westport.....	3	34 30
107480	Hattie & Eva.....	Digby.....	11	Edwin Hains.....	Freeport.....	4	39 40
111688	Hazelwood.....	Shelburne.....	29	G. C. Stevens.....	".....	10	100 00
111530	Island Girl.....	Digby.....	10	M. Sollows.....	".....	3	31 30
100064	Isma.....	St. John.....	31	Arthur Hicks.....	Westport.....	10	102 00
116234	J. W.....	Digby.....	14	J. W. Tidd.....	Whale Cove.....	7	63 70
111525	James W. Cousins.....	".....	87	J. F. Milberry.....	Digby.....	28	278 80
111838	Lavinia D.....	".....	21	J. Doucette.....	Mavillette.....	7	70 70
116210	Lucy A.....	Yarmouth.....	32	J. T. Therio.....	Meteghan.....	10	103 00
121691	Maccabe.....	".....	10	Edison Ellis.....	Mavillette.....	4	38 40
116237	Maple Leaf.....	Digby.....	10	H. P. Denton.....	Westport.....	3	31 30
107477	Maudie Ellen.....	".....	14	David Sproule.....	Digby.....	3	35 30
103184	Mayflower.....	".....	26	J. W. Snow.....	".....	4	54 40
111896	May Queen.....	Weymouth.....	15	Moses Tibodeau.....	Church Point.....	6	57 60
116232	Nettie M.....	Digby.....	12	Wm. McDormand.....	Westport.....	5	47 50
100895	New Home.....	Weymouth.....	31	Arthur Doucette.....	Mavillette.....	10	102 00
116660	Nora.....	Yarmouth.....	11	P. Doucette.....	".....	6	53 60
112285	Ospray.....	Digby.....	15	F. H. Corning.....	Beaver River.....	4	43 40
111834	Rosan.....	".....	11	F. J. Doucette.....	Mavillette.....	4	39 40
111835	Roxana.....	".....	11	Ainsley Titus.....	Westport.....	2	25 20
107334	Shamrock.....	Yarmouth.....	17	R. Thurber.....	Freeport.....	5	52 50
112289	Souvenir.....	Digby.....	27	J. O. Robichaud.....	Meteghan.....	16	98 00
111840	Sparrow.....	".....	29	M. T. Therault.....	".....	6	70 60
107610	St Bernard.....	Weymouth.....	24	J. D. Weaver.....	Belliveau Cove..	9	87 90
100609	Swan.....	Shelburne.....	56	Milton Hains.....	Freeport.....	13	148 30
103179	Trilby.....	Digby.....	31	F. S. Lent.....	".....	10	102 00
94694	Utah & Eunice.....	".....	33	Edwin Hains.....	".....	9	96 90
103711	Venite.....	".....	24	Jesse Ellis.....	Hartford.....	5	59 50
100543	W. Parnell O'Hara.....	".....	79	Jos. E. Snow et al.....	Digby.....	13	171 30

GUYSBORO' COUNTY.

90866	Alice.....	Halifax.....	12	James Hemlow.....	Liscomb.....	5	47 50
107992	Alice J. Davis.....	Canso.....	20	Edward Hearn.....	Canso.....	7	69 70
111422	Annie B.....	Halifax.....	26	Benj. Boudrot.....	Port Felix.....	4	54 40
112021	Annie M.....	Canso.....	29	John Leary.....	Queensport.....	5	64 50
112016	Blanche.....	".....	13	Simon Williams.....	Canso.....	5	48 50
103537	Bonacord.....	Halifax.....	12	B. L. Pelrine.....	Larry's River.....	5	47 50
112020	Bonny Kate.....	Canso.....	14	R. Meagher.....	Canso.....	6	56 60
112375	C. G. Munroe.....	Arichat.....	14	Chas. Mosher.....	White Head.....	5	49 50
116734	Cora Lee.....	Halifax.....	16	L. Kaiser.....	Beckerton.....	3	37 30
38418	Dolphin.....	Arichat.....	36	W. S. Peart.....	Guysboro.....	3	57 30
103328	Ella May.....	Pt. Hawkesbury	34	Hibbert Carr.....	Mulgrave.....	7	83 70
116347	Ethel.....	Arichat.....	11	Jas. Sinclair.....	Canso.....	5	46 50
116890	Ethel G.....	".....	12	Daniel George.....	L. White Head.....	5	47 50
116882	Fiona.....	".....	10	M. Pelrine.....	Larry's River.....	5	45 50
117093	Florence D.....	".....	11	H. Dorion.....	Port Felix.....	5	46 50
107993	Florence May.....	Canso.....	11	John Kennedy.....	Canso.....	6	53 60
112373	Flying Cloud.....	Arichat.....	13	S. Manett.....	Larry's River.....	4	41 40

6-7 EDWARD VII., A. 1907

List of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*GUYSBORO' COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
100818	Geneva Ethel.....	Barrington.....	29	M. Meagher.....	Canso.....	6	71 60
100228	Golden Dawn.....	Halifax.....	46	E. B. Pelrine.....	Larry's River.....	6	88 60
88220	Grandee.....	Halifax.....	14	Geo. Pace.....	Marie Joseph.....	5	49 50
116883	Grayling.....	Arichat.....	25	Wm. Reeves.....	Middle Melford.....	4	53 40
100815	Happy Home.....	Barrington.....	10	Samuel Snow.....	White Head.....	5	45 50
117091	Hazel Maud.....	Arichat.....	10	J. A. Rhynold.....	Dover.....	5	45 50
116740	Hilda M. Horton.....	Halifax.....	29	E. F. C. Horton.....	Beckerton.....	8	85 80
112374	J. B. Saint.....	Arichat.....	18	J. W. Sproul.....	Canso.....	5	53 50
116735	Lake Queen.....	Halifax.....	29	E. Furlong.....	Port Hilford.....	3	50 30
111908	Laura B. G.....	Arichat.....	10	B. Gerrior.....	Charlo's Cove.....	4	38 40
116732	Lena M.....	Halifax.....	28	A. W. Reid.....	Port Hilford.....	2	42 20
111910	Lizzie J. Greenleaf.....	Arichat.....	11	J. H. Richard.....	Charlo's Cove.....	6	53 60
100835	Lottie B.....	Lunenburg.....	12	John Boudroit.....	Dover.....	5	47 50
117094	Maggie Alice.....	Arichat.....	11	J. D. Cashin.....	Port Felix.....	5	46 50
112018	Maggie Bell.....	Canso.....	26	J. L. Chisholm.....	St. Francis Hbr.....	6	68 60
112136	Maple Leaf.....	Shelburne.....	48	Jno. Cousins.....	Canso.....	13	140 30
112017	Marconi.....	Canso.....	55	C. Lohnes.....	".....	11	133 10
111909	Margaret May.....	Arichat.....	12	J. Kavanagh.....	".....	4	40 40
112371	Mary A.....	".....	11	D. Casey.....	Dover.....	3	32 30
116886	Mary J.....	".....	11	Wm. Diggon.....	White Head.....	3	32 30
107999	Maud S.....	Canso.....	12	F. B. Saunders.....	Canso.....	5	47 50
112022	Minnie J.....	".....	14	J. Feltmate.....	White Head.....	5	49 50
100446	Minnie May.....	".....	12	C. H. Richard.....	Charlo's Cove.....	5	47 50
107998	Money Bush.....	".....	15	T. Richard.....	Port Felix.....	6	57 60
117051	Muriel G.....	".....	21	A. Munroe.....	White Head.....	7	70 70
103323	Nita.....	Pt. Hawkesbury.....	22	J. C. Davidson.....	Isaac's Harbour.....	3	43 30
112378	Olive S.....	Arichat.....	17	M. Sangster.....	New Harbour.....	5	52 50
112024	Reta S.....	Canso.....	13	L. Shrier.....	Canso.....	5	48 50
112372	River Swan.....	Arichat.....	11	Geo. Berrigan.....	".....	5	46 50
74139	Sadie.....	Halifax.....	44	I. Fougere.....	Larry's River.....	6	86 60
100255	Seaflee.....	".....	12	A. Munroe.....	White Head.....	3	33 30
111413	Sigdrifa.....	Lunenburg.....	13	Wm. Dort.....	Cole Harbour.....	7	62 70
112023	Silver Bell.....	Canso.....	14	S. J. Pelrine.....	Larry's River.....	4	42 40
116884	Silver Swan.....	Arichat.....	20	J. Bonvie.....	".....	4	48 40
112025	Squanto.....	Canso.....	13	F. H. Hawes.....	Canso.....	5	48 50
108000	St. Patrick.....	".....	18	G. L. Avery.....	Larry's River.....	6	60 60
107318	St. Stephen.....	Halifax.....	19	Moses Cohoon.....	Canso.....	3	40 30
96962	Sunrise.....	Yarmouth.....	18	T. Munroe.....	White Head.....	7	67 70
117052	Thrush.....	Canso.....	10	D. Myers.....	Canso.....	2	24 20
116885	T. Lilly.....	Arichat.....	10	W. Peart.....	Tor Bay.....	3	31 30
103199	Trilby.....	Canso.....	12	E. Flaherty.....	Canso.....	5	47 50
107994	True Love.....	".....	10	D. Walsh.....	".....	2	24 20
107991	Two Brothers.....	".....	14	Fred Jello.....	Port Felix.....	6	56 60
116887	Wenona.....	Arichat.....	10	J. Uloth.....	Cole Harbour.....	5	45 50

HALIFAX COUNTY.

111436	Adele.....	Halifax.....	30	J. C. Martin.....	Ketch Hbr.....	11	108 10
107313	Alice A.....	".....	16	Wm. McPherson.....	Tangier.....	5	51 50
103858	B & B Holland.....	".....	26	R. Holland.....	Duncan's Cove.....	9	89 90
90496	Black Prince.....	".....	18	Geo. Julien et al.....	W. Chezzetcook.....	5	53 50
116278	Christie Belle.....	".....	13	Z. Beaver.....	Spry Bay.....	2	27 20
112325	Commodore.....	".....	29	M. Lynch.....	Ferguson's Cove.....	6	71 60
103853	Dawn.....	".....	13	Harris Corkum.....	E. Jeddore.....	4	41 40
111428	Duchess.....	".....	12	Austin Zwicker.....	Indian Hbr.....	4	40 40
111425	Effie Howard.....	".....	23	John Verge.....	Sober Island.....	4	51 40
116512	Effie May.....	Lunenburg.....	49	Wm. J. Nauss.....	Dartmouth.....	4	77 40
77603	Eldon C.....	Shelburne.....	27	I. Bowser.....	Ostrea Lake.....	6	69 60

SESSIONAL PAPER No. 22

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*HALIFAX COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts.
90726	Ellen Maud.	Halifax.	16	G. Martin.	Terence Bay.	7	65 70
111434	Ermynthrude.	Halifax.	36	F. J. Darrach.	Herring Cove.	11	114 10
100535	Fair Play.	Yarmouth.	11	L. Holmes.	Halifax.	2	25 20
100247	Fairy Queen.	Halifax.	11	G. H. Nickerson.	Pennant.	4	39 40
116290	Flora M. J.	"	78	J. Julien, et al.	W. Chezzetcook.	18	205 80
80829	Florence B.	"	32	J. Richardson.	W. Jeddore.	5	67 50
100259	Florence G.	"	15	Caleb Gray.	Sambro.	4	43 40
111432	Gladys Elena.	"	16	C. W. Twohig.	Pennant.	3	37 30
107319	Globe.	"	32	C. W. Hart.	Sambro.	14	131 40
103544	Grace D.	"	11	G. Slaunwhite.	Terence Bay.	5	46 50
112131	Grace D. Day.	Shelburne.	39	A. Hubley.	Boutillier's Cove.	10	110 00
111747	Grace Darling.	Lunenburg.	100	O. Dauphinee.	Hackett's Cove.	17	200 70
116731	Grand Desert.	Halifax.	65	Martin Julien et al.	W. Chezzetcook.	17	185 70
116738	Gretta.	"	14	A. Russell et al.	Clam Hbr.	3	35 30
116287	Handy Andy.	"	15	W. Westhaver, et al.	Sober Island.	4	43 40
112129	Hattie.	Lunenburg.	12	A. Jollymore.	Indian Hbr.	4	40 40
116743	Hattie D.	Halifax.	62	R. Drew.	Terence Bay.	12	147 20
116284	Janet R.	"	37	J. Verge.	Sober Island.	4	65 40
103191	Jennie B.	Liverpool.	13	H. Wambolt.	Indian Hbr.	5	48 50
116747	Jessie W.	Halifax.	12	Henry Weinaut.	Boutillier's Cove.	4	40 40
100216	Katie M.	"	11	C. Nelson.	Halifax.	2	25 20
193312	Laura.	Pt. Hawkesbury.	13	R. Cooper.	Tangier.	3	34 30
96797	Laura Phoebe.	Halifax.	18	J. Kent.	Musquodoboit H.	5	53 50
116203	Laurel.	"	16	G. Pelham.	Herring Cove.	8	72 80
116513	Laurie H.	Lunenburg.	16	J. Slaunwhite.	Terence Bay.	5	51 50
83402	Louisa Maud.	Halifax.	21	H. Graves.	E. Dover.	4	49 40
111424	Maggie M.	"	13	J. Marryatt.	Pennant.	3	34 30
96805	Maggie May.	"	62	J. Fillis et al.	W. Chezzetcook.	16	175 60
116733	Maggie May.	"	17	F. J. Fleming.	Ketch Hbr.	9	80 90
111436	Maggie Wilson.	"	36	E. Dempsey.	Herring Cove.	12	121 20
111440	M. A. Josey.	"	17	L. M. Josey et al.	Spry Bay.	4	45 40
111421	Maple-leaf.	"	25	Eli Baker.	E. Jeddore.	5	60 50
100227	May.	"	10	E. Little.	Terence Bay.	3	31 30
107757	Mayflower.	Charlottetown.	18	F. Young.	Pleasant Point.	5	53 50
116736	Milo.	Halifax.	24	J. W. Gorman.	Herring Cove.	13	115 30
116739	Minnie M. Dora.	"	14	J. Beaver.	Spry Bay.	3	35 30
116282	Monica A. Thomas.	"	46	C. H. Thomas.	Herring Cove.	12	131 20
85665	Nellie D.	"	12	Wm. Munroe.	Sober Island.	4	40 40
103539	Neva.	"	11	E. Marryatt.	Pennant.	2	25 20
116745	Perseverance.	"	12	E. E. Shatford.	Indian Hbr.	3	33 30
94677	Progress.	"	14	D. Richardson.	L. W. Ship Hbr.	4	42 40
116749	Reliance.	"	14	C. Hubley.	Indian Hbr.	4	42 40
96806	Rising Sun.	"	28	R. Christian.	Prospect.	6	70 60
116272	Rosie M. B.	"	75	D. Bonaing et al.	W. Chezzetcook.	17	195 70
116447	San Juan.	Shelburne.	42	G. L. Baker.	W. Jeddore.	12	127 20
100218	Sarah M. W.	Halifax.	14	E. Weakley.	Terence Bay.	6	56 60
112137	Shamrock.	Shelburne.	37	E. Hayes.	Herring Cove.	10	108 00
116746	Spindrift.	Halifax.	15	E. Boutillier.	Indian Hbr.	4	43 40
116750	Stella R.	"	13	W. E. Murphy.	Pleasant Hbr.	3	34 30
111438	Theresa M. Gray.	"	30	Angus Gray.	Sambro.	13	122 30
96061	Tivoli.	Shelburne.	24	D. Duggan.	E. Dover.	4	52 40
103869	Uganda.	Halifax.	14	J. B. Stoddard.	Ship Hbr. ....	...	14 00
117142	Valkyria.	"	13	Harvey Covey.	Indian Hbr.	3	34 30
117143	Valmore.	"	11	L. Hubley.	"	4	39 40
100260	Violet.	"	12	J. H. Smith.	Sambro.	3	33 30
116283	Vixen.	"	13	H. McKenzie.	Gerrard's Island.	3	34 30
92578	Willetta.	"	12	Joseph Gray.	Sambro.	6	54 60
85378	Zephyr.	"	16	R. Slaunwhite.	Terence Bay.	6	58 60

6-7 EDWARD VII., A. 1907

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*

INVERNESS COUNTY.

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							¢ cts.
96778	Campania	Pt. Hawkesbury	11	C. Robin, Collas Co...	Eastern Hbr...	4	39 40
103313	Catherine	"	10	" " " "	" " " "	6	52 60
103325	Elizabeth Ann	"	11	D. Bourgeois	Belle Marche...	4	39 40
83196	Ethel Blanche	Pictou	17	W. J. Malcolm	Port Hawkesbury	4	45 40
96774	Florence	Pt. Hawkesbury	11	S. Bellefontaine	Eastern Hbr...	5	46 50
103317	Flying Star.	Pt. Hawkesbury	11	S. Bellefontaine	Eastern Hbr...	5	46 50
107997	Gertie Belle.	Canso	15	C. Robin, Collas Co...	" " " "	5	50 50
100212	James R.	Halifax	51	P. LeBlanc	" " " "	7	100 70
111795	Katie J.	Pt. Hawkesbury	11	Jno. McNeil	Port Hawkesbury	4	39 40
103316	Laura	"	10	U. Bourgeois et al ..	Belle Marche...	4	38 40
103315	Lillie	"	12	Peter Fiset	Eastern Hbr...	5	47 50
96775	Louise	"	11	S. Bellefontaine et al.	" " " "	5	46 50
103330	Lucy	"	11	T. Maillet	" " " "	5	46 50
96779	Majestic	"	12	C. Robin, Collas Co...	" " " "	5	47 50
96771	Marie	"	10	Jno. Roach	" " " "	5	45 50
96777	Marie Joseph	"	11	J. Poirier	Cheticamp	6	53 60
103314	Mary	"	10	P. Fiset	Eastern Hbr...	5	45 50
96769	Mary Lambert	"	11	C. Chiasson	Little River	5	46 50
69125	May Flower	Halifax	20	H. Chiasson	" " " "	7	69 70
103326	Mizpah	Pt. Hawkesbury	10	T. Lebrun	Grand Etang...	5	45 50
96770	O.L.B.	"	12	M. Aucoin	Belle Cote	4	40 40
103329	Saint Helier	"	12	C. Robin, Collas Co...	Eastern Hbr...	4	40 40
111792	St. Aubin	"	15	" " " "	" " " "	7	64 70
100448	Surprise	Canso	15	D. McDonald	Judique	5	50 50
96773	Virgin	Pt. Hawkesbury	10	M. Ramard	Little River	6	52 60
111793	Walla Walla	"	11	S. Bellefontaine	Eastern Hbr...	5	46 50
96776	Willie B.	"	21	" " " "	" " " "	7	70 70

KING'S COUNTY.

83261	Economist	Digby	14	Jesse Parker	Hall's Hbr	2	28 20
107479	Marguerite	"	25	Frank McDonald	Scott's Bay	4	52 40

LUNENBURG COUNTY.

111837	A.L.B.	Lunenburg	22	B. Cleveland	Lunenburg	5	57 50
112126	Acadia	"	91	Alex. Knickle	" " " "	17	200 70
116517	Aeme	"	91	W. C. Smith	" " " "	18	207 80
116526	Adelaide	"	13	J. Holland	" " " "	4	41 40
111641	Aguaquilla	"	100	F. Anderson	" " " "	18	207 80
107953	Ahava	"	85	W. C. Smith	" " " "	18	207 80
111728	Alameda	"	93	C. L. Silver	" " " "	17	200 70
107657	Alcaea	"	99	Alex. Knickle	" " " "	17	200 70
112115	Aldine	"	99	A. V. Conrad	Parks Creek	17	200 70
112107	Alexandra	"	93	F. Anderson	Lunenburg	18	207 80
111647	Alhambra	"	90	J. W. MacLachlan ..	" " " "	17	200 70
111738	Alice Gertrude	"	81	J. N. Rafuse	Conquerall Bank	19	214 90
112105	Alma Nelson	"	99	J. B. Young	Lunenburg	18	207 80
112101	Ambition	"	100	A. Himmelman	Rose Bay	20	222 00
116522	Anita	"	16	S. E. Winters	" " " "	5	51 50
111737	Annie M. W.	"	98	J. N. Wolfe	Getson's Cove ..	18	207 80
111750	Arabia	"	80	D. Heisler	Lunenburg	17	200 70
116499	Arkansas	"	111	J. B. Young	" " " "	19	214 90
112122	Atalaya	"	79	S. D. Herman	" " " "	17	199 70
103495	Athlon	"	99	W. C. Smith	" " " "	15	186 50

SESSIONAL PAPER No. 22

LIST of Vessels which received Fishing Bounty, &c. — Nova Scotia—*Con.*LUNENBURG COUNTY—*Continued.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts.
111740	Azalea	Lunenburg.....	80	J. A. Hirtle	Lunenburg.....	17	200 70
111412	Baden Powell.....	"	94	M. Westhaver	"	15	186 50
103501	Barcelona.....	"	99	R. Romkey	L. LaHave.....	17	200 70
1116498	Beatrice S. Mack..	"	99	W. C. Smith	Lunenburg.....	17	200 70
111734	Blake.....	"	99	J. N. Rafuse	Conquerall Bank	19	214 90
100571	Britannia.....	"	90	J. Backman	Rose Bay.....	16	193 60
111732	Calavera.....	"	90	H. Mosher.....	Lunenburg.....	18	207 80
112128	Campania.....	"	90	S. Ritcey	Riverport.....	18	207 80
112116	Cardinia.....	"	100	F. Anderson	Lunenburg.....	17	200 70
111718	Carl E. Richard....	"	99	E. Richard, sr.	Getson's Point..	19	214 90
116505	Cavalier.....	"	70	N. Reinhardt	La Have.....	16	183 60
111749	Champion.....	"	79	J. Publicover.....	Getson's Point..	19	213 90
111739	Clarence B.....	"	90	A. Ernst.....	Mahone Bay....	14	179 40
107122	Collector.....	"	99	W. N. Reinhardt..	La Have.....	17	200 70
111702	Colonia.....	"	98	A. H. Zwickler ..	Lunenburg.....	13	207 80
103759	Columbia.....	"	99	E. F. Zwickler ..	"	17	200 70
116497	Commander.....	"	69	J. Schmeisser.....	E. M. La Have..	15	175 50
107966	Companion.....	"	95	J. Publicover.....	Getson's Point..	17	200 70
111743	Corean.....	"	70	J. N. Rafuse.....	Conquerall Bank	18	197 80
111736	Coronation.....	"	98	H. W. Adams.....	Lunenburg.....	17	200 70
111708	Crofton McLeod..	"	85	J. W. McLean.....	Mahone Bay....	17	200 70
111637	Cyril.....	"	100	T. A. Wilson.....	Bridgewater....	17	200 70
111711	Defender.....	"	98	Alex. Knickle	Lunenburg.....	19	214 90
111710	Demering.....	"	85	J. Anderson.....	"	18	207 80
107986	Dove.....	"	95	S. D. Herman.....	"	18	207 80
111730	Earle V.S.....	"	100	H. Wynchacht	"	17	200 70
116528	Edith F.S.....	"	67	J. Schmeisser.....	E. M. La Have..	15	173 50
112099	Electro.....	"	88	E. Walters.....	Parks Creek....	18	207 80
111748	Elena.....	"	73	A. V. Conrad.....	"	17	193 70
83308	Ella.....	Liverpool.....	10	J. C. Hanson.....	Mahone Bay....	1	17 10
107127	Ellen L. Maxner..	Lunenburg.....	93	L. A. Hirtle.....	Lunenburg.....	19	214 90
116521	Ellwood.....	"	16	John Zinck.....	"	4	44 40
107123	Emulator.....	"	99	S. Oxner.....	Riverport.....	17	200 70
116506	E. M. Zellars.....	"	84	E. Zellars.....	Feltzen South..	18	207 80
112087	Ethel.....	"	99	W. N. Reinhardt..	La Have.....	17	200 70
116518	Eva June.....	"	93	W. C. Smith.....	Lunenburg.....	17	200 70
116520	Evelyn.....	"	18	James Geldert.....	"	3	39 30
103473	Flo F. Mader.....	"	100	C. U. Mader.....	Mahone Bay....	17	200 70
116531	Florence B. W.....	"	24	S. W. Westhaver..	Fox Point.....	6	66 60
111401	Frances Willand..	"	97	J. A. Hirtle.....	Lunenburg.....	16	193 60
116525	Gatherer.....	"	15	W. C. Smith.....	"	4	43 40
116495	George R. Alston..	"	99	A. V. Conrad.....	Parks Creek....	17	200 70
111742	Glenwood.....	"	99	D. Heisler.....	Lunenburg.....	17	200 70
103752	Glyndon.....	"	99	R. Romkey.....	L. La Have.....	17	200 70
116507	Golden Rod.....	"	76	J. Silver.....	Lunenburg.....	17	196 70
107289	G. S. Troop.....	"	99	L. B. Currie.....	W. Dublin.....	17	200 70
116527	Guide.....	"	73	W. N. Reinhardt..	La Have.....	17	193 70
112111	Havanah.....	"	100	A. V. Conrad.....	Parks Creek....	17	200 70
116442	Helen C. Morse....	"	98	J. Westhaver.....	Lunenburg.....	17	200 70
116494	Hero.....	"	18	E. Langille.....	La Have.....	7	67 70
107659	Hilda C.....	"	99	S. W. Oxner.....	Lunenburg.....	20	222 00
112109	Hispaniola.....	"	91	A. Knickle.....	"	17	200 70
107128	Huron.....	"	84	J. H. Wilson.....	"	17	200 70
103174	Iona.....	Shelburne.....	15	N. Chandler.....	Chester.....	5	50 50
107956	Iona.....	Lunenburg.....	98	S. Oxner.....	Riverport.....	17	270 00
112089	Iona W.....	"	78	A. Ernst.....	Mahone Bay....	14	177 40
111638	Ivanhoe.....	"	100	T. A. Wilson.....	Bridgewater....	18	207 80
116511	J. F. Norton.....	"	61	A. V. Conrad.....	Parks Creek....	11	139 10
100837	J. M. Young.....	"	99	J. B. Young.....	Lunenburg.....	17	200 70
107960	J. W. Mills.....	"	76	J. W. Mills.....	Mahone Bay....	12	161 20
111726	Juanita.....	"	100	W. C. Smith.....	Lunenburg.....	20	222 00
107970	Karimoc.....	"	97	S. Ritcey.....	Riverport.....	16	193 60

6-7 EDWARD VII., A. 1907

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*LUNENBURG COUNTY—*Continued.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	Nc. of Crew paid.	Amount of Bounty paid.
							\$ cts.
116509	Kasaga.....	Lunenburg.....	59	James Bell.....	Dublin Shore....	14	158 40
111404	Kimberley.....	".....	92	C. U. Mader.....	Mahone Bay....	18	207 80
111635	Latooka.....	".....	99	A. V. Conrad.....	Parks Creek....	18	207 80
107126	Lena F. Oxner....	".....	99	J. Geldert.....	Lunenburg.....	17	200 70
107660	Lila D. Young....	".....	100	J. B. Young.....	".....	20	222 00
107129	Lilla B. Hirtle....	".....	99	Benj. Anderson....	".....	17	200 70
103760	Lillian.....	".....	84	A. R. Morash.....	".....	16	193 60
111717	Linus A.....	".....	70	A. Corkum.....	E. M. La Have..	17	190 70
83316	Lottie.....	".....	76	J. Teel.....	Broad Cove....	21	225 10
111634	Loyal.....	Port Medway....	99	A. Ernst.....	Mahone Bay....	17	200 70
111735	Lucania.....	Lunenburg.....	99	R. Romkey.....	L. La Have.....	17	200 70
107120	Madeira.....	".....	99	T. Creaser.....	Riverport.....	20	222 00
112112	Maimie Dell.....	".....	98	C. U. Mader.....	Mahone Bay....	16	193 60
112095	Manhattan.....	".....	100	W. C. Smith.....	Lunenburg.....	18	207 80
116523	Mankato.....	".....	76	S. Walters.....	Parks Creek....	17	196 70
116519	Mrgr't E. Schwartz	".....	98	J. H. Schwartz....	Lunenburg.....	19	214 90
111709	Mariner.....	".....	100	A. V. Conrad.....	Parks Creek....	17	200 70
112123	Marion.....	".....	72	J. N. Rafuse.....	Conquerall Bank	17	192 70
112110	Markland.....	".....	99	J. W. McLean.....	Mahone Bay....	13	172 80
112119	Mary E. Smith....	".....	99	W. C. Smith.....	Lunenburg.....	17	200 70
107967	May Myree.....	".....	89	E. Richard, sr....	Getson's Point..	23	222 00
112086	Melba.....	".....	61	J. D. Sperry.....	Petite Rivière..	11	139 10
112100	Meteor.....	".....	99	T. Creaser.....	Riverport.....	17	200 70
107111	Millie Mace.....	".....	99	W. C. Smith.....	Lunenburg.....	17	200 70
107952	Minnie M. Cook...	".....	84	".....	".....	18	207 80
116503	Minnie Pearl....	".....	97	T. Hamm.....	".....	17	200 70
111701	Mizpah.....	".....	100	J. B. Young.....	".....	17	200 70
111645	Moran.....	".....	100	E. Richard, jr....	Getson's Point..	17	200 70
103758	Muriel.....	".....	110	E. Walters.....	Lunenburg.....	16	193 60
100606	Myra Louise.....	".....	17	A. Strum.....	Mahone Bay....	6	59 60
116530	Nahada.....	".....	94	H. Wynaecht....	Lunenburg.....	17	200 70
107968	New Era.....	".....	116	W. J. Cook.....	Riverport.....	18	207 80
112104	Nina.....	".....	10	J. Geldert.....	Lunenburg.....	3	31 30
112090	Noble H.....	".....	95	A. Ernst.....	Mahone Bay....	18	207 80
116502	Oceanic.....	".....	99	R. Ritcey.....	Riverport.....	17	200 70
116500	Oreda.....	".....	16	Henry Selig.....	Vogler's Cove..	3	37 30
112106	Oregon.....	".....	99	S. Oxner.....	Riverport.....	17	200 70
112120	Oressa Belle.....	".....	95	P. B. Zwicker....	Mahone Bay....	17	200 70
112124	Palanda.....	".....	78	C. U. Mader.....	".....	12	163 20
111642	Palatia.....	".....	95	C. L. Silver.....	Lunenburg.....	18	207 80
111725	Palmetto.....	".....	98	C. Smith.....	".....	17	200 70
112113	Parana.....	".....	99	D. Lohnes.....	Riverport.....	17	200 70
112125	Pearl.....	".....	14	D. Wilkie.....	Pentz Settlement	5	49 50
111712	Peerless.....	".....	95	A. H. Zwicker....	Lunenburg.....	17	200 70
111417	Pilgrim.....	".....	99	T. A. Wilson.....	Bridgewater....	17	200 70
111402	Protector.....	".....	95	".....	".....	24	250 40
107653	Renown.....	".....	83	W. C. Smith.....	Lunenburg.....	17	200 70
111648	Riviera.....	".....	96	A. Ross.....	M. La Have.....	20	222 00
111726	Roanoke.....	".....	100	A. Ernst.....	Mahone Bay....	20	222 00
107125	Roma.....	".....	99	D. Myra.....	Riverport.....	17	200 70
111741	Saratoga.....	".....	92	C. U. Mader.....	Mahone Bay....	17	200 70
116529	Scotia.....	".....	78	A. Burns.....	Day Spring.....	18	205 80
107963	Shamrock.....	".....	89	F. Anderson.....	Lunenburg.....	17	200 70
102108	Speculator.....	".....	99	J. Wamback.....	Parks Creek....	18	207 80
111744	Stanley.....	".....	100	T. A. Wilson.....	Bridgewater....	17	200 70
111407	Strathcona.....	".....	89	F. Anderson.....	Lunenburg.....	17	200 70
103500	St. Helena.....	".....	99	H. Wynaecht....	".....	18	207 80
111636	Tasmania.....	".....	99	W. C. Smith.....	".....	17	200 70
116532	Togo.....	".....	14	R. B. Stevens....	Tancook Island..	3	35 30
107651	Torata.....	".....	92	J. H. Wilson.....	Lunenburg.....	17	200 70
111733	Transvaal.....	".....	79	W. C. Smith.....	".....	15	185 50

SESSIONAL PAPER No. 22

List of Vessels which received Fishing Bounty, &c.—Nova Scotia.—*Con.*LUNENBURG COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
112114	Tribune	Lunenburg.....	22	A. R. Morash.....	Lunenburg.....	6	64 60
112117	Ulva	"	99	A. V. Conrad.....	Parks Creek ...	7	129 70
107957	Ungava	"	88	W. Cleverse.....	Pleasantville...	20	222 00
116510	Uranus.....	"	90	W. C. Smith.....	Lunenburg	19	214 90
116496	Valoria.....	"	99	A. R. Morash.....	"	17	200 70
111731	Vendetta.....	"	93	J. A. Hirtle.....	"	16	193 60
107964	Vernie May.....	"	76	A. Ernst.....	Mahone Bay.....	15	182 50
100811	Vesta Pearl.....	"	40	E. Boutilier.....	Marriott's Cove.	7	89 70
111409	Victoria.....	"	100	W. N. Reinhardt...	La Have.....	17	200 70
116504	W. C. Silver.....	"	97	K. Silver.....	Day Spring.....	22	236 20
111403	Willis C.....	"	82	A. Corkum.....	Lunenburg.....	1	93 61 60
111649	W. S. Wynot.....	"	100	C. U. Mader.....	Mahone Bay.....	18	207 90
112127	Yamaska.....	"	98	P. B. Zwicker.....	"	17	200 78
111419	Yukon	"	97	E. Ritecy.....	Riverpoet.....	18	207 00

PICOU COUNTY.

107330	Gertie M. Starr....	Halifax.....	16	Peter Roberts.....	Pictou.....	3	37 30
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QUEEN'S COUNTY.

73969	Bertha E.....	Halifax.....	21	W. H. Doggett....	White Point....	4	49 40
90840	Lena A.....	Port Medway...	11	C. A. Bowlby.....	Port Medway...	3	32 30
116583	Louisa A.....	Liverpool.....	10	W. Fraser.....	Port Mouton....	4	38 40
116915	Maggie & Esther ..	"	11	Reuben Colp.....	"	4	39 40
92568	Mary Kate.....	Shelburne.....	13	H. Fisher.....	S.W. Pt. Mouton	2	27 20
94833	Newstoy.....	Port Medway...	16	Wm. Atkins.....	Port Medway...	5	51 50
116351	Percy Roy.....	"	99	J. F. Wolf.....	"	19	214 90
100608	Vesper.....	Shelburne....	14	R. Williams.....	S.W. Pt. Mouton	4	42 40

RICHMOND COUNTY.

107961	Ada Mildred	Pictou.....	99	J. Yorston.....	River Bourgeois	21	229 10
116344	Annie B. M.....	Arichat.....	18	W. Monbourquette	Lardoise West..	6	60 60
103463	Annie May.....	"	11	J. Langley.....	Strait Canso....	3	32 30
111472	Annie May.....	"	17	J. Monbourquette	Rockdale.....	5	52 50
111479	Atalanta.....	"	15	Peter Bouchard...	River Bourgeois	5	50 50
75561	Boreas	Lunenburg.....	41	J. A. Colford.....	Port Richmond..	6	83 60
72061	C. P. M.....	Arichat.....	22	Alex. Burke.....	River Bourgeois	6	64 60
74100	Candid.....	"	23	D. Burke	"	7	72 70
96799	Catherine A. C....	Halifax.....	17	V. Poirier.....	Descousse	7	66 70
59484	Day Spring.....	"	36	A. Fougere.....	River Bourgeois	11	114 10
116343	Eva May.....	"	11	T. A. Boudrot.....	Petit de Grat....	5	46 50
88462	Fannie S.....	Arichat.....	28	John Murray.....	Port Richmond..	5	63 50
100383	Florence L.....	Sydney.....	10	C. Cordeau.....	River Bourgeois	4	38 40
112380	Florence M.....	Arichat.....	24	A. Mombourquette	Lardoise West..	6	66 60
116348	Florence M.....	"	16	Wm. Martell.....	Petit de Grat....	5	51 50
90436	Genesta	Barrington....	32	J. Walker.....	Basin R. I.....	4	60 40
88599	Guide	Arichat.....	38	E. Poirier.....	L. Descousse....	12	123 20
100161	Hilda Maud.....	Pt. Hawkesbury	46	J. D. Malcom.....	Port Malcom....	7	95 70
103470	Ida M. Burke.....	Arichat.....	16	S. P. Burke.....	St. Peters.....	4	44 40
111476	Indianna.....	"	11	Daniel Patte.....	Petit de Grat....	4	39 40
100490	Irene M. B.....	Lunenburg.....	66	F. Poirier.....	Descousse	16	179 60

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia.—*Con.*RICHMOND COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts.
83135	J. B. M.	Halifax...	20	J. Landry.....	Petit de Grat...	4	48 40
88467	Katie	Arichat.....	11	J. P. Le Blanc....	Port Royal.....	2	25 20
103469	Katie B.	"	16	John Kurke.....	River Bourgeois	6	58 60
103458	K. McKenzie..	"	17	W. P. Groom.....	Grand Greve...	4	45 40
111480	Lady Laurier..	"	12	S. A. Boudrot....	Petit de Grat...	5	47 50
117092	Lass of Gowrie	"	14	Joseph Petitpas..	Arichat.....	3	35 30
107374	Leah Hardy....	Sydney	20	E. Bouchie.....	River Bourgeois	5	55 50
111905	Lena Jane.....	Arichat.....	11	D. Boudrot.....	Petit de Grat...	6	53 60
111901	Lillian Louise	"	12	C. P. Boudrot....	"	4	40 40
112377	Lily May.....	"	18	A. Poirier.....	Goulet	7	67 70
103467	Lizzie May....	"	12	A. Boudrot.....	Petit de Grat...	6	54 60
116349	Lorina	"	18	S. Landry	Lardoise.....	6	60 60
72071	Lumen Diei....	"	20	U. Sampson.....	River Bourgeois	4	48 40
116350	Maggie F.	"	15	P. Fougere.....	Lardoise.....	5	50 50
107995	Maggie M. F...	Canso.....	15	H. D. Kindress...	Arichat.....	8	71 80
103532	Maria A.	Halifax.....	22	J. Walker.....	Basin R. I.	3	43 30
116345	Mary Alice....	Arichat.....	10	P. E. Sampson...	Lardoise.....	4	38 40
116881	Mary M.	"	21	D. Martell.....	"	7	70 70
111475	Mary Matilda..	"	15	J. Burke.....	St. Peter's Inlet	5	50 50
112379	Mary S.	"	18	J. Sampson.....	Lardoise.....	5	53 50
103462	Maud	"	20	H. Duyon.....	Arichat.....	3	41 30
72067	Minnie.....	Pt. Hawkesbury	26	J. Pelham.....	Janvrin Island.	6	68 60
111907	Minnie A.	Arichat.....	46	A. Sampson.....	River Bourgeois	10	117 00
111904	Minnie L.	"	15	Elias Bois.....	Petit de Grat...	5	50 50
116346	Native of Foucher.	"	16	J. D. McLeod....	Fourchie.....	4	44 40
74365	Nova Stella....	"	53	L. N. Poirier....	Descousse.....	15	159 50
64018	Ocean Bride....	Halifax.....	23	H. Richard.....	Arichat.....	3	44 30
85562	Oresa	"	14	J. F. Proctor....	Port Malcolm..	3	35 30
100231	Pearl.....	"	17	P. Le Blanc.....	Poulamond.....	4	45 40
100477	Pilot.....	Lunenburg..	42	W. Proctor.....	River Inhabit'nts	3	63 30
116341	Peroma.....	Arichat.....	17	P. Bouchard....	River Bourgeois	6	59 60
92571	Primrose.....	Halifax.....	14	E. V. Landry....	Petit de Grat...	5	49 50
88504	Quickstep....	Sydney	12	I. Boudreau....	River Bourgeois	6	54 60
116889	Saint Dominique.	Arichat.....	21	L. Marchand....	Petit de Grat...	5	56 50
116888	Swanhild.....	"	52	Wm. I. Le Vesconte.	River Bourgeois	11	130 10
103461	St. Lidwina...	"	11	Benj. Peters....	Lardoise.....	4	39 40
111902	St. Thomas....	"	19	Thos. Pottie....	Rockdale.....	4	38 40
103460	Two Brothers..	"	18	Maurice Peters..	Lardoise.....	7	67 70
100575	Tyler.....	"	54	C. Boudrot.....	Cannes.....	14	153 40
71034	Vanguard.....	"	51	T. Boudrot.....	Petit de Grat...	10	122 00

SHELBURNE COUNTY.

121802	Abbie May.....	Yarmouth....	10	W. E. Atkinson...	N. E. Point....	3	31 30
94632	A. C. Greenwood.	Shelburne....	15	T. D. Goodick....	Sandy Point....	6	57 60
116900	Ada and Pearl..	Yarmouth....	13	J. T. Duncan....	Clark's Hbr....	4	41 40
121700	Agnes E.	"	10	O. Phillips.....	"	3	31 30
121801	Alice M. Atwood.	"	10	D. A. Atwood....	Hawk.....	4	38 40
100617	Altona.....	Shelburne....	28	W. McMillan....	Lockeport.....	9	91 90
117134	Annie Lue.....	Yarmouth....	10	J. M. Crowell....	Smithville....	5	45 50
100612	Ardella.....	Shelburne....	10	E. Crowe.....	Sandy Point....	4	38 40
116824	Avis Pauline...	Barrington..	12	W. Kenney.....	Clark's Hbr....	3	33 30
116828	Beatrice	"	12	F. A. Swim.....	"	3	33 30
116855	Blanche.....	Shelburne....	12	J. Matthews....	E. Ragged Isl'd.	5	47 50
103186	Brittania.....	"	11	W. Enslow.....	W. Green Hbr..	4	39 40
90434	C. A. Goreham..	Barrington..	33	A. Goreham.....	L. Wood's Hbr..	7	82 70
103051	Carrie May....	Yarmouth....	25	H. Nickerson....	Wood's Hbr....	7	25 00
121654	Charles E.	"	13	C. E. Larkin....	Emerald Isle...	4	41 40
96970	Charlie Richardson.	Shelburne....	26	J. B. Harding....	Rockland.....	6	68 60
116826	Claremont A....	Barrington..	11	S. B. Penney....	Clark's Hbr....	4	39 40

SESSIONAL PAPER No. 22

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*SHELBURNE COUNTY—*Continued.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts.
116891	Claude B. Daley...	Barrington.....	25	W. E. Smith.....	Port La Tour...	8	81 80
121681	Claymore	Yarmouth.....	10	D. A. Gardner.....	Clark's Hbr.....	4	38 40
94942	Coronilla.....	Shelburne.....	28	H. Greenwood.....	Shag Hbr.....	4	56 40
107058	Defender	Barrington.....	20	A. Madden.....	Baccaro	7	69 70
121683	D. E. Nickerson...	Yarmouth.....	10	J. E. Nickerson...	Clark's Hbr.....	3	31 30
107057	Dolly Varden	Barrington.....	10	F. Atwood.....	Atwood's Brook.	2	24 20
121791	Eddie C.....	Yarmouth.....	10	C. D. Cook.....	U. Port La Tour.	4	38 40
116830	Edith Pauline	Barrington.....	10	R. Swim.....	Clark's Hbr.....	3	31 30
121688	Ethel May.....	Yarmouth.....	10	S. Messenger.....	West Head.....	4	38 40
121796	Etta N.....	".....	10	J. G. Newell.....	Newellton.....	3	31 30
103795	Etta Vaughn	Shelburne.....	98	B. P. Thorbourn	Sandy Point.....	21	229 10
107054	Favorite.....	Barrington.....	28	P. E. Crowell.....	Barrington.....	8	84 80
85476	Fleetwing.....	Shelburne.....	15	Wm. McMillan.....	Lockeport.....	5	50 50
107350	Forrester	".....	23	J. Pennington.....	Sandy Point.....	5	58 50
121697	Freddie M.....	Yarmouth.....	10	N. Crowell.....	Clark's Hbr.....	2	24 20
121793	Fredena.....	".....	10	S. Hopkins.....	".....	4	38 40
117041	Genevive.....	Barrington.....	11	C. A. Goreham.....	L. Wood's Hbr.....	5	46 50
121238	Gladiator.....	Shelburne.....	11	H. Enslow.....	McNutt's Island	2	25 20
116827	Gladys.....	Barrington.....	12	B. L. Goodwin.....	N. E. Point.....	4	40 40
111683	Greenwood.....	Shelburne.....	71	E. P. Greenwood.....	N. E. Harbour...	20	213 00
90647	Hattie Emeline.....	Yarmouth.....	12	C. A. Reynolds.....	Brass Hill.....	3	32 30
121797	Hattie & Ina.....	".....	10	A. H. Perry.....	N. W. Harbour...	3	31 30
80799	Hattie T.....	Barrington.....	16	D. Kendrick.....	Shag Hbr.....	5	51 50
107061	Herald.....	".....	42	W. O. Hopkins.....	Doctor's Cove...	6	84 60
111687	Ida M. Clarke.....	Shelburne.....	99	Wm. McMillan.....	Lockeport.....	22	236 20
117131	Iona & Ida.....	Yarmouth.....	13	W. N. Madden.....	Baccaro	4	41 40
116822	Jennet.....	Barrington.....	11	T. A. Kenney.....	Clark's Hbr.....	3	32 30
117133	Jennie Roy.....	Yarmouth.....	10	Robert Smith.....	Baccaro	4	38 40
116823	Jessie Roy.....	Barrington.....	12	J. A. Crowell.....	Clark's Hbr.....	4	40 40
116853	J. J. Cox.....	Shelburne.....	65	R. L. McCarthy.....	Shelburne.....	9	128 90
121692	Josephine.....	Yarmouth.....	10	F. N. Newell.....	West Head.....	4	38 40
121798	Kenneth S.....	".....	10	G. H. Smith.....	Clark's Hbr.....	4	38 40
107981	Kestrel.....	Shelburne.....	99	G. A. Cox.....	Shelburne.....	19	214 90
90438	Lark.....	Barrington.....	13	T. Ross.....	Up. Port La Tour	6	55 60
100329	La Rose.....	Yarmouth.....	13	Noah Abbott.....	Forbes Point...	2	27 20
117135	Laura B.....	".....	10	H. Swim.....	Clark's Hbr.....	3	31 30
117140	Laura B.....	".....	10	A. E. Nickerson.....	".....	3	31 30
94661	L. C. Tough.....	Shelburne.....	12	E. H. Swaine.....	Blanche.....	5	47 50
121693	Little Charlie	Yarmouth.....	10	H. Newell.....	West Head.....	3	31 30
103796	Mabel Denvers	Shelburne.....	14	J. H. Reynolds.....	Up. Port La Tour	6	56 60
121799	Mabel V.....	Yarmouth.....	10	D. V. Smith.....	Clark's Hbr.....	4	38 40
116829	Maple Leaf.....	Barrington.....	11	H. A. Penney.....	South Side.....	4	39 40
116854	Mariana.....	Shelburne.....	33	A. Swansburg.....	Little Hbr.....	10	104 00
83434	Mary May.....	".....	20	A. J. Firth.....	Shelburne.....	5	55 50
117643	Mattie & Charlie.....	Barrington.....	10	F. J. Nickerson.....	Clark's Hbr.....	3	31 30
103057	Mayflower.....	Yarmouth.....	12	Albert Crowell.....	Lockeport.....	5	47 50
111700	Miriam F.....	Liverpool.....	11	B. Thompson.....	W. M. Sable.....	3	32 30
121794	Mooveena.....	Yarmouth.....	10	B. C. Crowell.....	Port La Tour...	4	38 40
103175	Myrtle.....	Shelburne.....	10	Wm. Wolfe.....	B. Port Le Herbert.....	5	45 50
103800	Nellie I. King.....	".....	99	G. H. King.....	Sandy Point.....	19	214 90
117132	Nerna D.....	Yarmouth.....	10	J. R. Brammen.....	Baccaro	4	38 40
121689	Ocean Belle.....	".....	10	B. J. Newell.....	West Head.....	3	31 30
103194	Oressa.....	Liverpool.....	10	J. Bethell.....	Green Harbour...	4	38 40
90439	Oscar F.....	Barrington.....	18	G. Cunningham.....	N. E. Point.....	8	74 80
121682	Quick Step.....	Yarmouth.....	10	J. W. Kenney.....	Clark's Hbr.....	3	31 30
100820	Ranger.....	Barrington.....	11	A. Duncan.....	".....	2	25 20
107059	Reginald R.....	".....	16	T. E. Worthen.....	Barrington.....	5	51 50
117044	S. B. Millard	".....	20	J. Symonds.....	Clark's Hbr.....	6	62 60
121684	Seaton L.....	Yarmouth.....	12	W. H. Kenney.....	".....	3	33 30
107990	Terence C. Lockwood.....	Shelburne.....	98	Wm. McMillan.....	Lockeport.....	21	229 1 0

6-7 EDWARD VII., A. 1907

LIST of Vessels which received Fishing Bounty, &c.—Nova Scotia—*Con.*SHELBURNE COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts.
117139	Thalia D.	Yarmouth.	10	A. Duncan.	Clark's Hbr.	2	24 20
116895	Thelma E.	Barrington.	11	Allen Swim.	"	3	32 30
116589	Thistle.	Shelburne.	40	H. McAlpine.	Lockeport.	12	125 20
116825	Three Sisters.	Barrington.	11	W. H. Penney.	N. E. Point.	4	39 40
116448	Togo.	Shelburne.	18	E. C. Locke.	Lockeport.	5	53 50
121792	Twin Sisters.	Yarmouth.	10	R. W. Stephens.	Hawk.	4	38 40
121699	Una.	"	10	W. C. Nickerson.	Clark's Hbr.	3	31 30
103716	Valkyrie.	"	11	O. Garron.	Shag Harbour.	7	60 70
121696	W. F. Britcliffe.	"	10	A. F. Smith.	Up. Wood's Har.	5	45 50
77744	Whip-poor-will.	Shelburne.	17	A. Thomas.	Cape Negro.	6	59 60
117042	White Eagle.	Barrington.	10	Levi Nickerson.	Clam Point.	4	38 40
85541	Willie M.	"	24	S. Atwood.	Atwood's Brook.	6	66 60
121690	Winnifred.	Yarmouth.	10	A. Nickerson.	Clark's Hbr.	2	24 20
75722	Yuba.	"	15	F. Salisbury.	Port La Tour.	6	57 60
116449	Zephyr.	Shelburne.	11	S. Greenwood.	Port Saxon.	4	39 40
121656	Zilpha.	Yarmouth.	10	Martin Penney.	South Side.	3	31 30

VICTORIA COUNTY.

117028	Anna F.	Sydney.	14	J. G. Brewer.	South Ingonish.	4	42 40
112388	Annie Amelia.	"	13	M. Hawley et al.	Ingonish Ferry.	4	41 40
112384	Columbia.	"	10	D. C. Williams.	South Ingonish.	3	31 30
107379	Maggie.	"	11	C. J. Williams.	"	4	39 40
107377	Maggie Ella.	"	11	T. W. Donovan.	"	5	46 50
107355	Mary E.	"	10	A. McIntyre.	Ingonish Ferry.	5	45 50
112386	Shamrock.	"	11	A. McDonald.	South Ingonish.	4	39 40
100444	Stella May.	Canso.	12	S. P. Hawley.	Ingonish Ferry.	6	54 60

YARMOUTH COUNTY.

116838	Agnes M.	Yarmouth.	11	I. Doucette.	Tusket Wedge.	4	39 40
111879	Annie B.	"	20	T. D'Entremont.	W. Pubnico.	8	76 80
121652	Arabia.	"	10	E. J. Le Blanc.	Tusket Wedge.	3	31 30
121698	Argo.	"	10	M. Boudreau.	"	4	38 40
121695	Aroma S.	"	10	L. C. Amiro.	W. Pubnico.	4	38 40
121685	Augusta.	"	11	L. D. Boudreau.	Tusket Wedge.	3	32 30
94980	Aurore.	"	86	D. A. D'Entremont.	West Pubnico.	20	222 00
103187	Ben Bolt.	"	91	A. P. Stoneman.	Yarmouth.	15	186 50
107346	Caddie.	"	10	J. E. Perry.	Port Maitland.	4	38 40
116652	Champion.	"	29	J. A. Crocker.	Yarmouth.	9	92 90
111836	Chevalier.	Digby.	11	W. S. Sollows.	Port Maitland.	4	39 40
121694	Columbia.	Yarmouth.	10	N. S. Boudreau.	Tusket Wedge.	2	24 20
100605	Dawn.	Barrington.	49	H. A. Amiro.	W. Pubnico.	13	141 30
121686	Dora Lee.	Yarmouth.	10	J. P. Cotreau.	Tusket Wedge.	3	31 30
116205	Eddie James.	"	79	H. A. Amiro.	W. Pubnico.	19	213 90
112280	Edith L.	Digby.	26	J. A. Adams.	Port Maitland.	6	68 60
107332	Estelle.	Yarmouth.	15	S. Smith.	L. Argyle.	2	29 20
112282	Florence H.	Digby.	20	R. Haskell.	Port Maitland.	6	62 60
80798	Freddie G.	"	17	Alvin Webb.	"	6	59 60
117135	Fustama.	Yarmouth.	12	H. T. Hines.	Central Argyle.	2	26 20
116207	Gabriel A.	"	17	T. Jacquard.	Comeau Hill.	3	38 30
111876	Geneva May.	"	72	L. Amiro.	L. E. Pubnico.	19	206 90
90885	Georgiana.	"	90	H. Lewis.	Yarmouth.	21	229 10
117137	Glorianna.	"	10	A. Boudreau.	Tusket Wedge.	2	24 20
116894	Harry M. Johnson.	"	14	C. H. Crowell.	Yarmouth.	4	42 40
103717	Henry L.	"	10	A. C. D'Entremont.	W. Pubnico.	4	38 40
121655	Indianna.	"	10	M. D. Boudreau.	Tusket Wedge.	3	31 30

SESSIONAL PAPER No. 22

List of Vessels which received Fishing Bounty, &c.—Nova Scotia.

YARMOUTH COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
121795	John L.	Yarmouth.	11	F. L. Pothier.	Tusket Wedge. .	3	32 30
116204	Laurie J.	"	65	J. D'Entremont.	W. Pubnico. .	15	171 50
103709	Lizzie E.	"	19	E. J. Ellis.	Port Maitland. .	5	54 50
103718	Lucy.	"	10	A. D'Entremont.	W. Pubnico. .	4	38 40
116899	Lydia L.	"	14	N. Le Blanc.	Plymouth. .	3	35 30
116658	Mabel A.	"	15	P. A. Amiro.	W. Pubnico. .	1	22 10
107605	Mabel M.	Weymouth.	20	E. Ellis.	Salmon River. .	6	62 60
88596	M. A. Louis. .	Yarmouth.	64	A. P. Stoneman.	Yarmouth. .	20	266 00
103712	Marguerite.	"	10	L. A. D'Entremont.	W. Pubnico. .	3	31 30
107337	Marguerite.	"	57	L. P. D'Entremont.	"	16	170 60
111523	Mildred P.	"	11	H. McManus.	Yarmonth. .	4	39 40
88402	Mizpah.	Digby.	53	L. D'Entremont.	W. Pubnico. .	10	124 00
121687	Monitor.	Yarmouth.	10	A. Doucette.	Tusket Wedge. .	3	31 30
116897	Myrtle S.	"	12	A. Shaw.	Sandford. .	2	26 20
111875	Nelson A.	"	72	H. A. Amiro.	W. Pubnico. .	19	206 90
121658	Ora Nickerson.	"	12	W. H. Nickerson.	Argyle Sound. .	3	33 30
103706	Regine.	"	10	L. A. D'Entremont.	W. Pubnico. .	1	17 10
111521	Retta E.	Digby.	10	C. Sollows.	Port Maitland. .	4	38 40
121653	Royal.	Yarmouth.	10	G. Boudreau.	Tusket Wedge. .	3	31 30
88589	Sanford.	"	20	W. A. Killam.	Yarmouth. .	5	55 50
100323	Senora.	"	85	M. A. Surette.	W. Pubnico. .	21	229 10
100313	Souvenir.	"	71	G. H. D'Entremont.	"	20	213 00
121660	Squanto.	"	11	A. L. Doucette.	Tusket Wedge. .	3	32 30
117138	Two Brothers.	"	11	J. L. Surette.	Pinkney Point. .	3	32 30
121651	Valentina.	"	10	S. Le Blanc.	Tusket Wedge. .	4	38 40
121659	Viola.	"	10	J. Le Blanc.	"	3	31 30
116202	Why Not.	"	10	M. Huskins.	Rockville. .	4	38 40

PROVINCE OF NEW BRUNSWICK.

CHARLOTTE COUNTY.

116965	Admiral Togo.	St. Andrews. .	12	W. Benson.	Seal Cove.	2	26 20
107913	Arnold B.	"	10	H. H. Cheney.	White Head. .	3	31 30
107903	Ava M.	"	17	G. A. Johnson.	Woodward's Cove	3	38 30
111503	Bonnie Jean.	St. John.	12	F. Ingersoll.	Flagg's Cove. .	2	26 20
107905	Centennial.	St. Andrews.	16	J. F. Morse.	White Head. .	3	37 30
88253	E. B. Colwell.	St. John.	19	J. Barry.	Beaver Hbr. .	4	47 40
103114	Edward Morse.	St. Andrews.	32	A. Calder.	Welshpool. .	7	81 70
103789	Effie B. Nickerson.	Shelburne.	22	A. Stanley.	Flagg's Cove. .	6	64 60
80882	Ella Mabel.	St. Andrews.	14	E. G. Lee.	Beaver Hbr. .	3	35 30
116675	Evangeline.	"	15	Arthur Breen.	Seal Cove. .	3	36 30
80803	Exenia.	Windsor.	18	Milton Cronk.	Flagg's Cove. .	5	53 50
83466	Fannie May.	St. Andrews.	19	E. B. Goodwin.	St. Andrews. .	4	47 40
111552	Flora B.	"	13	N. Ingersoll.	Woodward's Cove	4	41 40
116676	Frank.	"	17	O. Wilcox.	Seal Cove. .	3	38 30
94835	Georgie Linwood.	Digby.	25	J. R. Moses.	Flagg's Cove. .	3	46 30
107916	Glenita C.	St. Andrews.	12	C. E. Guptill.	White Head. .	4	40 40
107910	Grace and Ethel.	"	16	R. Ingersoll.	Woodward's Cove	6	58 60
111839	Harry C.	Digby.	16	Cecil Cross et al.	Beaver Hbr. .	3	37 30
107437	Hattie L.	St. Andrews.	12	E. Benson.	Seal Cove. .	3	33 30
83463	Havelock.	"	33	Wm. James.	Wilson's Beach. .	3	54 30
116677	Hazel L.	"	15	M. Lorimer.	Grand Hbr. .	2	29 20
103119	Hortense.	"	15	W. J. Morse.	White Head. .	4	43 40
116961	J. E. Garland.	"	72	S. Brown.	Wilson's Beach. .	13	164 30
112316	Jessie C.	"	18	J. M. Calder.	"	4	46 40
103397	Jessie James.	"	11	J. Frankland.	White Head. .	4	39 40
77766	Laconic.	Shelburne.	15	J. Dickson.	Flagg's Cove. .	1	22 10

6-7 EDWARD VII., A. 1907

List of Vessels which received Fishing Bounty, &c.—New Brunswick—*Con.*CHARLOTTE COUNTY—*Continued.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
88273	Lillian E.....	St. Andrews...	13	S. L. Dakin	Beaver Hbr.....	6	55 60
88407	Linnet	Digby	15	J. W. Hatt	Seal Cove.....	3	36 30
107438	Minnie F.....	St. Andrews...	11	W. A. Guptill	"	2	25 20
103705	Nebula.....	Yarmouth.....	24	N. Beal	Flagg's Cove....	3	45 30
92518	Peril	St. Andrews...	18	M. Eldridge.....	Beaver Hbr.....	3	39 30
103993	Pythian Knight.....	"	19	F. Ingersoll.....	Flagg's Cove	4	47 40
107806	Rena F.....	St. John.....	12	J. Ingersoll.....	Woodward's C've	5	47 50
83253	Rescue	Annapolis	17	James Nesbitt.....	Flagg's Cove....	6	59 60
111556	She Said No.	St. Andrews...	11	J. R. Moses.....	"	3	32 30
107433	Sir John.....	"	11	Hiram Morse.....	White Head.....	3	32 30
59387	Telephone	"	19	J. Brown et al.....	Wilson's Beach..	3	40 30
116964	Tethys	"	20	G. L. Johnson.....	Leonardville....	2	34 20
103998	Try Again.....	"	15	A. W. Ingersoll.....	Woodward's C've	3	36 30
111555	Valkyrie	"	16	L. C. Watt.....	"	4	44 40
103111	Volunteer.....	"	14	G. Ingersoll.....	"	2	28 20
77969	Wave Queen.....	"	11	J. Foster.....	Grand Hbr.....	4	39 40
97149	Winnie.....	"	12	J. Holland.....	Seely's Cove....	2	26 20
107917	Zelma.....	"	17	H. Frankland.....	White Head.....	3	38 30

GLOUCESTER COUNTY.

72099	Adelina.....	Chatham.....	12	C. Lanteigne.....	Lemeque.....	4	40 40
103009	Adeline Gladys.....	"	12	P. D. Blanchard.....	Caraquet.....	5	47 50
103081	Albatross.....	"	13	Wm. Fruing & Co.....	Shippegan.....	4	41 40
112156	Albert W.....	"	10	P. M. Chiasson.....	Caraquet.....	4	38 40
103279	Alice Maud.....	"	10	J. X. Lanteigne	"	4	38 40
97194	Alika.....	"	12	L. Paulin, sr.....	Lemeque.....	4	40 40
112162	Alma.....	"	12	A. Duguay.....	"	5	47 50
103763	Alouette.....	"	10	Wm. Fruing & Co.....	Shippegan.....	3	31 30
92419	Anna.....	"	12	A. D. Chiasson.....	Lemeque.....	4	40 40
100960	Annie M.....	"	11	W. S. Loggie Co.....	Chatham.....	3	32 30
96739	Argeline.....	"	14	O. Poulin.....	Caraquet.....	5	49 50
103085	Argentina.....	"	12	C. Robin, Collas Co ..	Caraquet.....	3	33 30
100983	Bee.....	"	11	"	"	3	32 30
61431	Bee.....	"	11	Paul Noël.....	Lemeque.....	4	39 40
103072	Ben Hur.....	"	11	John Leclerc.....	Caraquet.....	4	39 40
72079	Betsy.....	"	13	Wm. Fruing & Co.....	Shippegan.....	4	41 40
100975	Big Bear.....	"	10	Estate R. Young.....	Caraquet.....	1	17 10
116474	Blanchard.....	"	12	M. John.....	"	4	40 40
100299	Blanchard.....	"	12	C. Robin, Collas Co ..	"	4	40 40
103589	Blenheim.....	"	13	"	"	3	34 30
103780	Britannic.....	"	13	Wm. Fruing & Co.....	Shippegan.....	4	41 40
100780	Britannic.....	"	13	W. S. Loggie Co.....	Chatham.....	5	47 50
111465	C. R. C.....	"	13	C. Robin, Collas Co ..	Caraquet.....	4	41 40
100988	Caesar.....	"	10	Philip Rive.....	"	3	31 30
100774	Calliope.....	"	12	"	"	4	40 40
103271	Celia.....	"	11	D. Gallien.....	"	2	25 20
103585	Cerdric.....	"	14	P. Rive.....	"	4	42 40
100784	Charlotte.....	"	13	Estate R. Young.....	"	3	34 30
100789	Chazalie.....	"	11	"	"	3	32 30
96730	Christina.....	"	11	C. Robin, Collas Co ..	"	3	32 30
101000	Condor.....	"	10	Wm. Fruing & Co.....	Shippegan.....	4	38 40
103083	Corsair.....	"	10	"	"	4	38 40
100916	Cygnnet.....	"	12	C. Robin, Collas Co ..	Caraquet.....	4	40 40
100971	Cyprien.....	"	10	J. O. Le Bouthillier.....	"	4	38 40
100913	Daffo-il.....	"	10	Wm. Fruing & Co.....	Shippegan.....	4	38 40
100915	Dawn.....	"	12	C. Robin, Collas Co ..	Caraquet.....	4	40 40
103076	Dipper.....	"	12	W. S. Loggie Co.....	Chatham.....	4	40 40
103948	Dora.....	"	12	C. Robin, Collas Co ..	Caraquet.....	4	40 40
112155	Dora.....	"	10	S. Doiron.....	Miscou Centre..	4	38 40

SESSIONAL PAPER No. 22

LIST of Vessels which received Fishing Bounty, &c.—New Brunswick—*Con.*GLOUCESTER COUNTY—*Continued.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
100999	Dove.....	Chatham.....	11	Wm. Fruing & Co.....	Shippegan.....	4	39 40
100998	Eagle.....	".....	10	".....	".....	5	45 50
116979	Elie Anne.....	".....	17	X. X. Lanteigne.....	Caraquet.....	4	45 40
103590	Eliza.....	".....	13	C. Robin, Collas Co.....	".....	5	48 50
100293	Eliza.....	".....	15	Estate R. Young.....	".....	4	43 40
100911	Emperor.....	".....	10	Wm. Fruing & Co.....	Shippegan.....	4	38 40
100786	Empress.....	".....	12	Estate R. Young.....	Caraquet.....	2	26 20
103776	Esk.....	".....	14	".....	".....	5	49 50
100772	Estelle.....	".....	13	P. Rive.....	".....	3	34 30
100787	Ethel.....	".....	11	Estate R. Young.....	".....	4	39 40
100905	Evangeline.....	".....	10	P. A. Lanteigne.....	".....	5	45 50
92417	Evangeline.....	".....	11	M. Poulin.....	Little Lemeque.....	5	46 50
103001	Falcon.....	".....	10	Wm. Fruing & Co.....	Shippegan.....	4	38 40
103077	Fame.....	".....	10	G. D. Mallet.....	".....	4	38 40
100298	Fisher.....	".....	12	Elie Chiasson.....	Little Lemeque.....	4	40 40
61445	Flavie.....	".....	13	Wm. Fruing & Co.....	Shippegan.....	4	41 46
111468	Fleetwing.....	".....	14	".....	".....	4	42 40
61405	Fly.....	".....	11	A. McLaughlin.....	Tracadie.....	4	39 40
112165	Flying Cloud.....	".....	13	J. F. Robichaud.....	Shippegan.....	4	41 40
112151	Flying Foam.....	".....	18	C. Robin, Collas Co.....	Caraquet.....	3	39 30
100782	Flying Foam.....	".....	12	Estate R. Young.....	".....	4	40 40
100912	Foam.....	".....	10	J. Z. Chiasson.....	".....	4	38 40
116479	Fortuna.....	".....	10	P. Boudreau.....	Mizzonette.....	3	31 30
111467	Four Brothers.....	".....	13	P. Albert.....	Caraquet.....	4	41 43
100778	Gambetta.....	".....	13	W. S. Loggie Co.....	Chatbam.....	4	41 40
100954	Gazelle.....	".....	10	".....	".....	4	38 40
111464	Gazelle.....	".....	13	C. Robin, Collas Co.....	Caraquet.....	4	41 40
100968	Gem.....	".....	11	".....	".....	5	46 50
96733	Gem.....	".....	12	Wm. Fruing & Co.....	Shippegan.....	5	47 50
103766	Genesta.....	".....	12	T. Poirier.....	Caraquet.....	3	33 30
116980	Georgina.....	".....	15	G. Duguay (Lange).....	Little Lemeque.....	4	43 40
103282	Gilknockie.....	".....	11	Estate R. Young.....	Caraquet.....	2	25 20
103086	Gipsy.....	".....	20	W. S. Loggie Co.....	Chatham.....	4	48 40
111848	Gipsy.....	".....	15	Wm. Fruing & Co.....	Shippegan.....	4	43 40
100964	Gladstone.....	".....	10	I. Lanteigne.....	Caraquet.....	3	31 30
100910	Gleaner.....	".....	13	Luke Lanteigne.....	".....	4	41 40
107775	Gold Seeker.....	".....	13	C. Robin, Collas & Co.....	Caraquet.....	3	34 30
112157	Grasshopper.....	".....	16	P. Rive.....	".....	4	44 40
92418	Grip.....	".....	12	G. Chenard.....	".....	4	40 40
100790	Guiding Star.....	".....	11	Estate R. Young.....	".....	4	39 40
111849	Happy Home.....	".....	16	H. Le Bouthillier.....	".....	5	51 50
100956	Harold N.....	".....	12	P. F. Mallet.....	Shippegan.....	5	47 50
100994	Hercules.....	".....	10	P. M. Lanteigne.....	Caraquet.....	4	38 40
107771	Heron.....	".....	13	Wm. Fruing & Co.....	Shippegan.....	4	41 40
103765	Hirondelle.....	".....	11	A. Leclerc.....	Caraquet.....	5	46 50
61425	Hope.....	".....	13	J. V. Lanteigne.....	".....	4	41 40
100303	Hope.....	".....	12	Estate R. Young.....	".....	3	33 30
103939	Hope.....	".....	11	C. Rail.....	Lameque.....	3	52 30
100906	Hotspur.....	".....	10	P. Rive.....	Caraquet.....	4	38 40
117181	Ida.....	".....	16	J. Savoy.....	Lemeque.....	4	44 40
103931	Irene.....	".....	12	Wm. Fruing & Co.....	Shippegan.....	4	40 40
96724	Isabel.....	".....	11	J. B. Hebert.....	Caraquet.....	5	46 50
103289	Jersey Lily.....	".....	12	Wm. Fruing & Co.....	Shippegan.....	3	33 30
100958	John B.....	".....	11	W. S. Loggie Co.....	Chatham.....	3	32 30
100965	Josephine.....	".....	11	P. Rive.....	Caraquet.....	3	32 30
112169	Kathleen.....	".....	15	Wm. Fruing & Co.....	Shippegan.....	4	43 40
111466	King Edward.....	".....	14	C. Robin, Collas Co.....	Caraquet.....	4	42 40
103949	Kingfisher.....	".....	13	Wm. Fruing & Co.....	Shippegan.....	3	34 30
103288	Kite.....	".....	10	".....	".....	3	31 30
107774	Klondyke.....	".....	14	C. Robin, Collas Co.....	Caraquet.....	4	42 40
103283	Koh-i-noor.....	".....	13	P. Rive.....	".....	3	34 30
111461	Ladysmith.....	".....	17	H. Chiasson.....	Little Lemeque.....	5	52 50

6-7 EDWARD VII., A. 1907

LIST of Vessels which received Fishing Bounty, &c.—New Brunswick—*Con.*GLOUCESTER COUNTY—*Continued.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner. or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid. \$ cts.
103003	Lark	Chatham..	10	Wm. Fruing & Co....	Shippegan	4	38 40
107773	L'Etoile	"	15	P. Gallien	Caraquet.....	5	50 50
112152	Lillian	"	15	C. Robin, Collas Co..	"	3	36 30
100972	Lizzie D.	"	11	Estate R. Young	"	4	39 40
100902	Lord Stanley	"	10	Wm. Fruing & Co....	Shippegan	4	38 40
116977	Mabel	"	16	W. S. Loggie Co	Chatham.....	5	51 50
112154	Mac	"	11	J. McWard	Miscou Hbr....	5	46 50
116480	Maggie	"	10	James Nixon	Mizzonette	4	38 40
100955	Majestic	"	16	W. S. Loggie Co	Chatham.....	4	38 40
112158	Maple Leaf	"	13	Wm. Fruing & Co....	Shippegan	4	41 40
116978	Margaret	"	16	W. S. Loggie Co	Chatham.....	4	44 40
112163	Margaret Ann	"	13	John Jones	Little Lemeque.	5	48 50
107779	Marie	"	15	G. Savoy	Shippegan	4	43 40
72100	Marie	"	11	Eugene Gauvin	Lemeque.....	4	39 40
103278	Marie Celia	"	13	C. Robin, Collas Co..	Caraquet.....	4	41 40
117182	Marie Etoile	"	20	J. A. Doiron	"	5	55 50
100292	Marie Joseph	"	12	L. Gauvin	Little Lemeque.	4	40 40
100295	Marie Louisa	"	18	J. A. Poulin	Caraquet.....	4	46 40
116471	Marie Louise	"	10	G. Chiasson	"	3	31 30
111847	Mary	"	14	D. Albert	"	4	42 40
103084	Mary Emma	"	11	Wm. Fruing & Co....	Shippegan	3	32 30
92413	Mary Jane	"	14	P. Doiron	Caraquet.....	5	49 50
100781	Mary Louise	"	11	W. S. Loggie Co	Chatham.....	5	46 50
116478	Mary O	"	11	J. O. Cormier	Mizzonette	3	32 30
100957	Mary R	"	12	W. S. Loggie Co	Chatham.....	5	47 50
116475	Mary Rose	"	17	Wm. Cormier	Caraquet.....	5	52 50
112161	Mary Star	"	15	H. Le Bouthillier	"	5	50 50
112150	Mary Star of the Sea	"	15	L. Friolet	"	5	50 50
111844	Mary Star of the Sea	"	14	C. Robin, Collas Co..	"	3	35 30
116477	Mary Star of the Sea	"	20	F. Savoy	Shippegan	4	48 40
103088	Max	"	10	M. Cormier	Caraquet.....	5	45 50
103768	Mayflower	"	13	C. Robin, Collas Co..	"	4	41 40
111462	Mayflower	"	10	Harrison Kent	Miscou Hbr....	4	38 40
107777	May Flower	"	11	O. Benoit	Little Lemeque.	4	39 40
100779	Mermaid	"	11	W. S. Loggie Co	Chatham.....	5	46 50
112164	Merry Christmas	"	13	Celestin Jean	Little Lemeque.	4	41 40
100300	Mikado	"	13	C. Robin, Collas Co..	Caraquet.....	3	41 40
88669	Morning Star	"	11	G. Gionet	Pokemouche	3	32 30
103004	Oriole	"	11	Wm. Fruing & Co....	Shippegan	3	32 30
103005	Osprey	"	10	"	"	4	38 40
100904	P.T.S.	"	11	Hugh Lanteigne	Caraquet.....	4	39 40
100297	Palma	"	14	Amedee Ache	Lemeque.....	5	49 50
100776	Patrick	"	11	P. Rive	Caraquet.....	3	32 30
103778	Pelican	"	13	Wm. Fruing & Co....	Shippegan	4	41 40
103764	Petrel	"	12	"	"	3	33 30
116974	Providence	"	18	M. Lanteigne	Caraquet.....	3	39 30
96740	Providence	"	13	T. H. Le Bouthillier	"	5	48 50
96732	Providence	"	11	Wm. Fruing & Co....	Shippegan	4	39 40
72076	Providence	"	12	"	"	5	47 50
103287	Raven	"	11	E. Leclerc	"	4	39 40
100775	Redgauntlet	"	11	P. Rive	Caraquet.....	3	39 40
100952	Replevin	"	10	C. Robin, Collas Co..	"	4	38 40
103078	Reward	"	13	J. De Grace	Shippegan	3	34 30
97191	Rita	"	12	C. Robin, Collas Co..	Caraquet.....	4	40 40
111470	River Branch	"	11	Wm. Fruing & Co....	Shippegan	4	39 40
193946	Robin	"	12	C. Robin, Collas Co..	Caraquet.....	4	40 40
103587	Romulus	"	19	W. S. Loggie Co	Chatham.....	4	47 40
92404	Rosa	"	17	Fabien Ache	Lemeque.....	4	45 40
100908	Rosalie	"	10	E. O. Le Bouthillier	Caraquet.....	3	31 30
100773	Rupert	"	12	P. Rive	"	4	40 40
74401	Sara	"	11	J. P. Noel	Lemeque.....	5	46 50
100907	Sarah	"	10	Estate R. Young	Caraquet.....	3	31 30

SESSIONAL PAPER No. 22

LIST of Vessel which received Fishing Bounty, &c.—New Brunswick—*Con.*GLOUCESTER COUNTY—*Concluded.*

Official Number.	Name of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							¢ cts.
103010	Sarah B.	Chatham.	10	A. S. Lanteigne.	Caraquet.	4	38 40
103584	Saxon.	"	13	P. Rive.	"	4	41 40
100959	Sea Bird.	"	10	W. S. Loggie Co.	Chatham.	4	38 40
106914	Sea Flower.	"	11	C. Robin, Collas Co.	Caraquet.	4	39 40
100901	Sea Flower.	"	12	Estate R. Young.	"	3	33 30
96731	Sea Star.	"	13	J. Savoy.	Shippegan.	4	41 40
100961	Silver Moon.	"	14	W. S. Loggie Co.	Chatham.	4	42 40
100788	Sir Charles.	"	11	Estate R. Young.	Caraquet.	3	32 30
100963	Stanley.	"	10	P. Rive.	"	3	31 30
103087	Stanley.	"	10	F. Baudin.	Miscou.	4	38 40
103767	Stella Maris.	"	19	C. Robin, Collas Co.	Caraquet.	4	47 40
116972	St. Andre.	"	15	A. A. Ache.	Lemeque.	4	43 40
116473	St. Anne.	"	14	O. Chiasson.	"	4	42 40
111469	St. John.	"	13	J. A. Ache.	"	4	41 40
112167	St. Joseph.	"	10	R. Gionet.	Caraquet.	4	38 40
103008	St. Joseph.	"	12	A. Ache.	Lemeque.	5	47 50
107776	St. Peter.	"	12	"	"	4	40 40
111845	Superior.	"	14	C. Robin, Collas Co.	Caraquet.	3	35 30
103772	Surprise.	"	10	T. Blanchard.	Mizzonette.	4	38 40
103947	Swallow.	"	13	C. Robin, Collas Co.	Caraquet.	4	41 40
103006	Swallow.	"	11	Wm. Fruing & Co.	Shippegan.	3	32 30
103762	Swan.	"	14	"	"	5	49 50
109986	Swift.	"	11	F. Chiasson (Jno.).	Island River.	5	46 50
103761	Swing.	"	11	L. B. Lanteigne.	Caraquet.	2	25 20
100777	Teutonic.	"	11	W. S. Loggie Co.	Chatham.	5	46 50
96738	Three Brothers.	"	12	J. S. Albert.	Caraquet.	4	40 40
117184	Three Brothers.	"	15	D. F. Chiasson.	Abraham Village.	5	50 50
103082	Thrush.	"	10	Wm. Mallet.	Shippegan.	4	38 40
100918	Tickler.	"	12	C. Robin, Collas Co.	Caraquet.	4	40 40
103583	Two Brothers.	"	11	W. S. Loggie Co.	Chatham.	4	39 40
112159	United Empire.	"	17	Estate R. Young.	Caraquet.	4	45 40
103285	Valkyrie.	"	12	P. Rive.	"	4	40 40
103775	Victoria.	"	16	W. S. Loggie Co.	Chatham.	5	51 50
117183	Vina.	"	14	J. Noel.	Lemeque.	4	42 40
100995	Voltaire.	"	10	P. Rive.	Caraquet.	4	38 40
100966	Von Moltke.	"	11	P. J. Frigot.	"	3	32 30
103588	Vulture.	"	13	W. S. Loggie Co.	Chatham.	4	41 40
100953	White Wings.	"	10	Estate R. Young.	Caraquet.	4	38 40
100973	World's Fair.	"	11	"	"	4	39 40
103079	Wren.	"	11	Wm. Fruing & Co.	Shippegan.	4	39 40
100920	Zephyr.	"	12	C. Robin, Collas Co.	Caraquet.	4	40 40

NORTHUMBERLAND COUNTY.

96725	Bessie T.	Chatham.	10	Donald Loggie.	Burnt Church.	3	31 30
100969	John Bull.	"	10	Henr. Albert.	Neguac.	4	38 40
61528	Lillian.	Guysboro.	41	John White.	L. Neguac.	5	76 50
116476	Mary Beatrice.	Chatham.	10	J. Branson.	Chatham.	1	17 10
92420	Mary Louise.	"	13	D. Loggie.	Burnt Church.	4	41 40

RESTIGOUCHE COUNTY.

94959	Winnie G. S.	Lunenburg.	26	Donald McGregor.	Dalhousie.	4	54 40
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ST. JOHN COUNTY.

94698	Carrie H.	St. John.	20	W. J. Wilson.	Lorneville.	5	55 50
75757	Etta.	Yarmouth.	17	J. McAfee.	"	5	52 50
80831	Glide.	Lunenburg.	16	G. Hampton.	St. John.	3	37 30

6-7 EDWARD VII., A. 1907

LIST of Vessels which received Fishing Bounty, &c.—New Brunswick—*Con.*ST. JOHN COUNTY—*Concluded.*

Official Number.	Names of Vessel.	Port of Registry.	Tonnage.	Name of Owner or Managing Owner.	Residence.	No. of Crew paid.	Amount of Bounty paid.
							\$ cts
100156	Hustler.....	St. John.....	44	A. Thompson.....	Dipper Hbr.....	6	86 60
100320	Lena.....	Barrington.....	13	G. H. Thompson.....	Chance Hbr.....	3	34 30
77883	Lost Heir.....	Port Medway.....	15	R. Maguire.....	St. John.....	2	29 20
100090	Ruby.....	St. John.....	15	W. J. Dean.....	Musquash.....	3	36 30
80630	Vanity.....	Yarmouth.....	11	H. J. Mawhinney.....	Chance Hbr.....	2	25 20
116724	Walter C.....	St. John.....	18	A. Cunningham.....	Lorneville.....	3	39 30
10-704	Whisper.....	Yarmouth.....	31	C. Harkins.....	Dipper Hbr.....	4	59 40

PROVINCE OF PRINCE EDWARD ISLAND.

KING'S COUNTY.

116303	Bella Rose.....	Charlottetown..	21	Matthew Rose.....	Bayfield.....	4	49 40
92675	Can't Help It.....	Pictou.....	39	F. Reynolds.....	Murray Hbr.....	8	95 80
100445	Carrie O.....	Canso.....	12	E. Colbert.....	Beach Point.....	4	40 40
116294	Charlotte S.....	Charlottetown..	14	Reuben Penney.....	Murray Hbr. S...	2	28 20
75904	Empress.....	".....	26	John Gosbee.....	Murray River.....	4	54 40
107759	Hustler.....	".....	13	L. McNeill.....	Beach Point.....	5	48 50
100696	Marion Emmerson..	Pictou.....	30	R. Cohoon.....	".....	8	86 80
107751	Minnie Laura.....	Charlottetown..	31	Percy White.....	Cape Bear.....	3	31 00
90206	Minnie Mack.....	".....	15	T. Poole.....	Souris.....	4	43 40
107982	Muriel.....	Shelburne.....	25	S. Sencabaugh.....	Beach Point.....	5	60 50
85642	Our Hope.....	Charlottetown..	36	E. Dicks.....	Georgetown.....	4	64 40
116296	Outlook.....	".....	21	H. Jackson.....	Beach Point.....	5	56 50
64869	Sarah L. Oxner.....	Halifax.....	34	E. Delorey.....	Georgetown.....	3	55 30
107185	Stroler.....	Charlottetown..	12	J. Dicks.....	".....	4	40 40
107770	Success.....	".....	15	R. McKenzie.....	Cable Head.....	5	50 50
116292	Wilena Fraser.....	".....	13	J. McKenzie.....	Beach Point.....	4	41 40

PRINCE COUNTY.

107758	Daisy.....	Charlottetown..	13	D. Fraser.....	Alberton.....	5	48 50
90855	Delta.....	".....	25	Alex. Laviolette.....	Skinner's Pond..	6	67 60
111850	Johnny M.....	Chatham.....	12	J. T. Murphy.....	Ebbs Fleet.....	2	26 20
103592	Rosamond.....	Charlottetown..	18	D. O. Champion.....	Baltic.....	4	46 40
94992	Sarah P. Ayer.....	".....	64	John Champion.....	Alberton.....	10	135 00
103193	Startle.....	Halifax.....	11	A. Genoit.....	".....	3	32 30
107760	Western Prince....	Charlottetown..	10	W. Richard.....	".....	3	31 30

QUEEN'S COUNTY.

107763	Guinea.....	Charlottetown..	10	B. Harding.....	French River...	4	38 40
103580	Maggie E. C.....	Lunenburg.....	20	J. H. McLeod et al...	".....	5	55 50
100474	R. Beatrice.....	Charlottetown..	19	J. Delaney.....	".....	4	47 40
92745	Surprise.....	".....	18	Frank Pidgeon.....	".....	5	53 50
85518	W. F. Elizabeth....	Sydney.....	10	Thomas Doyle.....	Rustico.....	5	45 50

PROVINCE OF QUEBEC.

GASPE COUNTY.

94963	Golden Seal.....	Halifax.....	32	E. Cormier.....	Amherst, M. I..	8	88 80
103318	Little Heir.....	Pt Hawkes'bury.	19	T. Larade.....	Le Moulin.....	4	47 40
88464	Mary E.....	Arichat.....	20	N. Boudreau.....	Amherst, M. I..	4	38 40
85400	Minnie M.....	Magdalen Isl'ds.	13	H. Cormier.....	".....	4	41 40
83399	Minnie May.....	".....	10	Wm. Boudreau.....	".....	4	38 40
111430	Shamrock.....	Halifax.....	23	A. Vigneau.....	".....	5	58 50
94675	Success.....	".....	16	R. J. Leslie & Co....	".....	6	58 60

SAGUENAY COUNTY.

85750	H. B.....	Quebec.....	57	E. Bourdeau.....	Esquimaux Pt...	9	120 90
111621	Marie Anna.....	".....	27	Chas. Gagné, sr.....	Grand Metis....	4	55 40
75680	Sea Star.....	".....	52	L. S. Cormier.....	Esquimaux Pt...	8	108 80

SESSIONAL PAPER No. 22

APPENDIX No. 2.

BRITISH COLUMBIA.

REPORT ON THE FISHERIES OF BRITISH COLUMBIA FOR THE SEASON
OF 1905, BY INSPECTORS C. B. SWORD, J. T. WILLIAMS AND E. G.
TAYLOR.

DISTRICT No. 1.

NEW WESTMINSTER, B.C., April 10, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to inclose statistics of the fisheries for District No. 1, British Columbia, for the year 1905. These include halibut (none of which are taken in this district) brought into the ports of Vancouver and New Westminster, which have been taken in Districts Nos. 2 and 3, mainly the former.

The salmon pack this year has been very good, 846,998 cases. This is not as much as was put up in 1901, though had the necessary labour in the canneries been obtainable, the 1901 pack might have been not only equalled but exceeded. During the run there were altogether five days in which the canneries had to place the fishermen on the limit (viz., 200 fish in the 24 hours to each boat), being unable to handle more.

This total is made up of 811,340 cases of sockeyes, 5,507 cases of springs, 3,304 cases of humpbacks and 26,847 of cohoes.

It will be observed that the pack this year is almost wholly composed of sockeyes.

In comparing this pack with that of former years, the 26,140 cases put up at Esquimalt (District No. 3) should be taken into account. On Puget Sound the pack was 825,453 cases, practically all Fraser river salmon, so that the pack of these fish for the two countries is just about equal.

In 1901, the Fraser river pack was 984,911 cases and Puget Sound pack 1,106,643 cases.

In explanation of the large increase in the amount of fresh and frozen salmon, this includes 2,000,000 lb. of salmon (mainly sockeye) exported to Puget Sound canneries after the expiration of the annual close season when our own canneries had closed down. The Indian consumption on account of the heavy run is also estimated at a much higher amount than in poor years.

The oil and guano returns are simply those of the Fraser River Oil & Guano Works, as the district as now limited does not cover any dog fishing grounds.

The fish roe, while one-half larger than for the larger district, does not include any herring spawn, there being practically none of this collected by the Indians in this district as now limited, but the increase is accounted for by the larger quantity of the salmon roe available; 13,000 lb. of this was salted and shipped to Japan.

The quantities given for halibut are the exact returns given by the New England Fish Company and the Cold Storage Companies; the fish taken by individual fishermen and consumed locally coming into the returns for Districts Nos. 2 and 3.

Nearly all the herring taken, which in former years were brought to Vancouver for bait, would have been entered in the Fraser river returns. These were taken at Nanaimo and come into the statistics of District No. 3. The small quantity given for District No. 1 this year represents the catch in Burrard Inlet, which was trivial. Dis-

6-7 EDWARD VII., A. 1907

trict No. 3 statistics also include 240,320 lb. put up at the Unique Cannery, Fraser river, as 'Dry salted', 'Kippers', 'Bloaters' and 'Digby Chicks.'

It will be seen that the total value of the fisheries for this district shows a large increase over the returns of 1904, although in that year the catch from the greater part of what is now District No. 3 was included. This increase is of course mainly attributable to the canned salmon pack, which is this year ten times the value of that of 1904. The actual pack was between six and seven times that of 1904, but the higher price obtained makes up the difference.

Your obedient servant,

C. B. SWORD,

Inspector of Fisheries.

DISTRICT No. 2.

PORT ESSINGTON, March 25, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to inclose my annual statistical report of the Fisheries of the Northern coast of British Columbia, District No 2, for the year ending 1905, including statement of salmon packs, of the different canneries.

These returns show a slight increase in the aggregate, the total value of fish and fish products in 1905 being \$2,011,199 against \$1,902,046, in 1904. Although there has been a decrease in the pack of canned salmon in 1905, other branches of the industry have been more fully developed during the year, consequently the loss occurring from the decrease in the salmon pack, has not materially affected the statistical returns.

SALMON.

The total pack of salmon for the district for the season of 1905, is as follows :—

	Cases.
Sockeye	228,232
Cohoe.....	12,342
Spring.....	19,864
Humpback.....	9,411
	<hr/> 269,849

Against in 1904 :—

	Cases.
Sockeye.....	243,384
Cohoe.....	22,840
Spring.....	24,583
Humpback	31,296
	<hr/> 322,103

Approximate detailed decrease and increase, season 1905.

	Cases.
Skeena river, decrease	40,000
Rivers Inlet "	11,000
Northern coast "	3,000
Naas river, increase	3,000

With reference to the decrease shown in the aggregate salmon pack in my district for the year 1905, viz., about 50,000 cases, you will notice that 40,000 of this occurs on the Skeena river, and is attributable to several causes. In the first place there were three canneries less in operation than last season, consequently less boats were fishing,

SESSIONAL PAPER No. 22

but undoubtedly there was a smaller and shorter run of sockeye, as the fishermen averaged per boat less last season than in 1904.

I also consider that the immense quantity of snags in the principal drifts acted most detrimentally, and was one of the chief causes of the decrease in the pack, the small snag boat now in operation on the Skeena river is entirely inadequate, in fact is of little use, as she cannot handle the immense snags that accumulate in the principal drifts, not to mention the terrible destruction of nets entailed.

I may also say in this connection that the work of enforcing the fishery regulations on the Upper Skeena, that was authorized by the department, was most successful, the three fishery officers, and Overseer Helgesen, placed a check on this illegal work, which had been proceeding for years, and I am gratified to be able to report that no barricades were constructed during the season, on the spawning grounds of the Upper Skeena, and the illegal sale of dried salmon, that had been on the increase and had almost assumed the importance of an industry, was entirely stopped.

I may call your attention to Overseer Helgesen's long and interesting report on his work in this district, last season, forwarded to the department by me with my deductions and recommendations on January 5, 1906.

I may also say that during last season the department undertook the work of removing the obstructions on the Oxstahl river, a tributary of the Skeena, that had been in existence for a considerable time. These obstructions were removed in sufficient time to enable the sockeye to ascend to their spawning grounds in the lake, and they were seen in thousands spawning in the different streams tributary to this lake, this being the first time in my experience that sockeye have reached these spawning grounds in any quantity, and I consider this will be a valuable acquisition to the area of spawning ground tributary to the Skeena river.

The department have already issued instructions for the removal of the Copper river obstructions, and the work will be proceeded with as soon as climatic conditions are favourable and render the work practicable. This will again open up a vast area of spawning ground which will be tributary to the Skeena river.

I may call the attention of the department to the desirability of erecting a twenty million capacity hatchery on the Upper Skeena, with as little delay as possible, this I consider of the utmost importance.

With reference to Rivers Inlet, I have again to report a magnificent run of sockeye, equalling if not surpassing that of 1904, indeed the run was so heavy at times that the cannerymen were unable to handle the fish, and from the 20th of July to the 27th, there was no fishing at all on the Inlet, owing to the scarcity of cans. I am aware the pack was about 11,000 cases short of 1904, but I attribute this to the fact that the cannerymen not anticipating so heavy a run, and in view of the probable 'big run' on the Fraser, prepared for smaller packs, and when the heavy run arrived they had not sufficient cans and were unable to procure them.

Fishery Officer Nordschow reports that the fishery regulations were observed throughout the season, with very few exceptions, that the spawning grounds on Oweekayno lake were carefully guarded during the fall, and that the Indians in taking their winter supply of food, observed the regulations in every respect.

I consider that up to and during the season of 1905, fishery matters on Rivers Inlet were in the most satisfactory condition.

With regard to the Naas river, I may inform you that the run was good, showing a slight increase in the pack against that of 1904.

Snags are very prevalent in this river and it is desirable to place a small snag boat here for the purpose of keeping the main drifts clear of snags; a very heavy loss is sustained annually by the cannerymen and fishermen. My suggestion relative to this matter was to place the small snag boat now in operation on the Skeena river, on the Naas, when the proposed new one for the Skeena is available.

In September, last year, the department authorized the Reverend McCullough, of Naas River, to make a preliminary survey of the obstruction existing at the head waters of this river, near Magiarden lake, with a view to ascertain the exact conditions existing there, Mr. McCullough made a complete survey of said obstruction, taking photo-

6-7 EDWARD VII., A. 1907

graphs and making sketch plans, estimates and specifications, and provided me with a most able and intelligent report, this I forwarded to the department on March 15, 1905, with my deductions and recommendations.

I consider the removal of this obstruction is of vital importance to the prosperity of the Naas river salmon fisheries, it will open up a vast area of spawning ground which should in a few years materially influence and increase the quantity of sockeye now captured on this river. I trust this important work will be completed during next winter.

With regard to our other northern coast salmon fisheries, there was an average catch last season. These fisheries do not vary much, one can generally forecast the probable catch, and I have no fears for their depletion so long as they are protected and patrolled during the fishing season, they should remain in their present condition indefinitely.

I may inform you that throughout the district the fishery regulations have been rigorously enforced, and, considering the number of licenses issued and the extensive area of water fished, and the number of fishermen of all sorts and nationalities engaged in these operations, there have been very few infringements of the regulations.

Referring to the qualo or dog salmon, I may inform you that there has been a considerable increase, the Japanese when they have finished with the sockeye and coho fishing, now turn their attention to the dog salmon, they have erected five small salteries in different parts of the district, and employ the local Indians to help them catch these fish, which they salt for the Japanese market.

I believe these fisheries in another two years will increase to the proportions of an industry, as the dog salmon abounds in almost inexhaustible quantities in the different rivers and creeks throughout the district.

HALIBUT.

I may inform you that three-quarters of the whole of the British Columbia catch of halibut are caught in District No. 2, but are taken to Vancouver and exported from that port, only a comparatively small quantity being exported direct from my district, therefore the statistical returns are forwarded to the department by Inspector Sword in his report as it has been customary for the port from which the fish are shipped, to make the returns.

I have already drawn up and submitted to the department a draft code of proposed regulations and suggested an amendment to the Fishing by Foreign Vessels Act, and trust that this immensely valuable commercial product will receive the protection of the department, as foreign vessels are undoubtedly rapidly depleting our halibut banks.

OULACHON.

This fish is not receiving the attention it deserves, it can be caught in large quantities during the spring of the year, on all the principal rivers in the district, but with the exception of the Indians, it receives very little attention as a commercial commodity.

MISCELLANEOUS.

With regard to the above I may say that though the waters in my district abound with an almost inexhaustible supply of edible fishes, salmon, halibut, all species of cod, oulachon, herring, &c., the population is so sparse that there is comparatively little fishing outside the salmon and halibut.

In view of the greater interest now being taken in the utilization of our deep sea fisheries, and also in view of the fact that the population of the district is rapidly increasing, and in all probability during the next few years one or more large cities will come into existence, I consider it most desirable that the regulations under which these are to be prosecuted should receive the immediate attention of the department.

I have the honour to be, sir,

Your obedient servant,

JOHN T. WILLIAMS,

Inspector of Fisheries.

SESSIONAL PAPER No. 22

DISTRICT No. 3.

NANAIMO, B.C., April 19, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to inclose my statistical report of the fisheries for District No. 3, British Columbia, for the year ending December 31, 1905. The returns for this division show a marked increase and the developments in the various branches of our fisheries have been most satisfactory during the past year, especially is this development noticeable in the increased pack of dry salted salmon and in the expansion of the herring industry.

SALMON.

The operation of salmon traps in the Straits of Juan de Fuca has been a very important feature in the salmon industry of this province, and the measure of success that has attended the trap fishing has stimulated the industry to a great extent. The number of traps on the west coast of Vancouver Island would have been much greater if it were not for the fact that this was the year for the large run of salmon to the Fraser river.

All the salmon caught in the traps were taken in barges to the canneries on the Fraser, with the exception of those taken from the traps of Todd & Sons, which supplied their large new cannery at Esquimalt. The salmon shipped from the traps to the Fraser River canneries are included in the statistical returns of Inspector Sword, and so will not appear in my returns. The indications are that next year the number of salmon traps in the Straits of Fuca will be greatly augmented. The Capital City Canning Co. will have a new cannery completed and ready for the next season's operations at Victoria.

I have no doubt that all the companies operating traps on the west coast of Vancouver Island will erect canneries at or near Victoria, as taking the salmon from the traps to the Fraser river canneries by tugs and scows is expensive, they are apt also to deteriorate in quality if taken a long distance.

This was the banner year for the British Columbia Packers Cannery at Alert Bay. They are now beginning to reap the benefit of the hatchery at Nimpkish lake. This year they placed in their hatchery five million and thirty-seven thousand (5,037,000) sockeye eggs.

In my preliminary report I recommended the erection of small hatcheries for the artificial propagation of salmon. I would again emphasize the importance of such an undertaking; the success of the Nimpkish hatchery is an evidence of the wisdom of artificial propagation.

The Clayoquot Canning Co. put up a considerable quantity of spring salmon (mild cured) for the German market. The spring salmon taken in the traps were mild cured at Victoria and shipped to foreign markets. The demand for the spring salmon is growing rapidly and next year a number of new companies will be engaged in the export of this valuable fish.

HERRING.

The operation of the Scottish herring curing staff under the supervision of Mr. J. J. Cowie has given a stimulus to the herring industry from which we will reap the benefit for all time to come.

This is shown in the extensive preparations now going on to handle the herring that annually visit our bays and harbours in such vast shoals. The practical lessons given by Mr. Cowie and his staff will also result in placing upon our market a first-class article.

6-7 EDWARD VII., A. 1907

WHALING.

The whaling station at Barclay Sound is now in full operation, and as sulphur bottoms, humpbacks, and many kinds of smaller whales are abundant all along the coast, this enterprise ought to yield a rich harvest to the promoters. Another whaling station is to be erected farther up the coast at Rose Harbour.

HALIBUT.

The halibut banks in my division extend all along the west coast of Vancouver Island. As they receive very little protection, poaching is carried on to a considerable extent.

It is to be regretted that fishing firms operating in British Columbia do not enter more extensively into the halibut industry.

SEALING.

The Victoria Sealing Co., despatched 18 vessels to the Behring Sea, but one *The Fawn*, was lost with all hands on board. The 17 vessels which returned secured an average catch of 765 skins; last year the average catch of 21 vessels was 626 skins.

A smaller number of Indians were engaged in the sealing along the west coast of Vancouver Island than last year.

PATROL.

Should the large fishing areas in this division receive the attention and protection that their importance demands, it is absolutely necessary that patrol boats should be placed on the east and west coasts of this island.

As the waters between Vancouver Island and the mainland are not exposed to the storms of the Pacific, a small cruiser would do the work required for the east coast.

I have the honour to be, sir,

Your obedient servant,

EDWARD G. TAYLOR,
Inspector of Fisheries.

SESSIONAL PAPER No. 22

STATEMENT

Of the Yield of Fisheries in District No. 1, Southern part of British Columbia,
for the Year 1905.

Kinds of Fish.	Quantity.	Price.	Value.
		\$ cts.	\$
Salmon, canned.....48-lb. cases.	846,998	6 00†	5,081,988
" salted.....Brls.	2,200	10 00	22,000
" dry salted.....Lb.	9,700,000	0 05	485,000
" dried (Indian cons'n)....."	1,000,000	0 05	50,000
" smoked....."	120,900	0 10	12,000
" fresh and frozen....."	7,500,000	0 10	750,000
Sturgeon....."	20,000	0 10	2,000
Halibut....."	7,200,000	0 05	360,000
Herring, fresh and salted....."	100,000	0 05	5,000
" smoked....."	10,000	0 10	1,000
Onlachons, fresh....."	50,000	0 05	2,500
" salted.....Brls.	150	10 00	1,500
" smoked.....Lb.	2,000	0 10	200
Smelts....."	180,000	0 05	9,000
Trout....."	150,000	0 10	15,000
Cod....."	300,000	0 05	15,000
Shad....."	15,000	0 05	750
Mixed....."	100,000	0 05	5,000
Fish oil.....Galls.	62,000	0 35	21,700
Fish roe.....Lb.	30,000	0 05	1,500
Guano.....Tons	617	30 00	18,510
Estimate of oysters, clams, crabs and other fish not included in above.....			10,000
Total, value.....			6,869,648

† The pack being nearly all sockeye and put up in $\frac{1}{2}$ -lb. cans, was sold at over \$6 per case, so it is valued at that price instead of \$4.80, as formerly.

CAPITAL invested in District No. 1, (Southern) British Columbia Fisheries, 1905

Description of Property.	Number.	Value.	Total.
		\$	\$
<i>Fisheries—</i>			
Canneries, wharfs, &c.....	37	151,500	
Vessels †.....	29	230,000	
Boats.....	3,000	180,000	
Gill and seine-nets, (fathoms).....	450,500	338,250	
Trawls and lines.....		5,000	
Scows.....	150	30,000	
Cold storage plants.....	3	120,000	
Oil factories.....	1	35,000	
Salteries.....	4	6,000	
Traps.....	3	20,000	
			1,115,750

Employees in Fisheries.	Number.	Total.
Fishermen.....	5,552	
In canneries.....	4,692	
On vessels.....	220	
		10,464

† Including 4 steamers, valued at \$130,000, used in halibut fishing.

6-7 EDWARD VII., A. 1907

BRITISH COLUMBIA SALMON PACK—DISTRICT No. 1, 1905.

Name of Cannery.	Owners or Agents.	Sockeye.	Coho.	Springs.	Hump-backs.	Totals.
		Cases.	Cases.	Cases.	Cases.	Cases.
Albion.....	B. C. Packers' Association.	327,721	9,545	1,617		338,88
Atlas.....						
Anglo-American.....						
Acme.....						
Brunswick No. 2.....						
Canadian Pacific.....						
Currie McWilliam's.....						
Colonial.....						
Celtic.....						
Cleve.....						
Dinsmore.....	A.B.C. Packing Co., Ltd..	102,592	2,463	2,587		107,642
Ewen's.....						
Imperial.....						
Pacific Coast.....						
Terra Nova.....						
Phoenix Britannia.....						
British American.....						
Canoe Pass.....						
Wadhams'.....						
British Columbia.....						
Scottish Canadian.....	Malcolm Cannon & Co. . .	98,774	3,768	594	2,750	105,886
Gulf of Georgia.....						
English Bay.....	J. H. Todd & Sons.....	44,980	4,000			48,980
Richmond.....						
Beaver.....	Frederation Brand.....	27,407	53	4	52	27,516
Lighthouse.....						
Vancouver.....	Canadian Canning Co.	59,992		41	242	60,275
Fraser River.....						
Burrard Canning Co.....		12,502				12,502
Steveston Canning Co.....		9,100				9,100
Buttermier & Dawson.....		22,851				22,851
St. Mungo.....		29,190	5,508	664		35,362
Peter Birrell.....		12,944				12,944
C. S. Windsor.....		11,079				11,079
Northern Canning Co.....		18,597	13		260	18,870
National Packing Co.....		2,732				2,732
Vancouver Fish & Curing Co.....		1,000				1,000
British Columbia Canning Co.....		29,879	1,497			31,376
		811,340	26,847	5,507	3,304	846,998

SESSIONAL PAPER No. 22

SALMON PACK, 1905—DISTRICT No. 2, BRITISH COLUMBIA.

Name of Cannery.	Location.	Sockeye, 48 lb. cases.	Cohoe, 48 lb. cases.	Spring, 48 lb. cases.	Hump- back, 48 lb. cases.	Cannery Totals.	District Totals.
		Cases.	Cases.	Cases.	Cases.	Cases.	Cases.
Balmoral.....	Skeena River...	18,122	1,428	3,354	1,223	24,127	
British American	"	12,828	661	3,304	.....	16,793	
Inverness.....	"	10,601	422	1,106	3,100	15,229	
Oceanic.....	"	11,950	899	2,241	1,769	16,859	
Claxton.....	"	13,495	1,699	1,511	1,431	18,136	
Skeena River Com. Co	"	6,745	579	1,042	.....	8,366	
Cassiar.....	"	7,538	373	808	.....	8,719	
Alexandra.....	"	2,063	866	1,052	.....	3,981	
Ladysmith.....	"	1,375	320	180	.....	1,875	
Totals.....		84,717	7,247	14,598	7,523	.....	114,085
Brunswick	Rivers Inlet...	22,772	.....	80	.....	22,852	
Wadham's.....	"	22,826	.....	.....	.....	22,826	
Good Hope.....	"	16,443	.....	33	.....	16,476	
Rivers Inlet.....	"	20,730	.....	238	.....	20,968	
Totals.....		82,771	.....	351	.....	.....	82,122
Mill Bay.....	Naas River..	8,396	1,482	2,066	733	12,677	
Port Nelson.....	"	7,585	864	645	1,107	10,201	
John Wallace.....	"	8,481	737	629	.....	9,847	
Totals.....		24,462	3,083	3,340	1,840	.....	32,725
Lowe Inlet.....	Northern Coast..	7,683	373	.....	.....	8,056	
Namu.....	"	3,000	639	.....	48	3,687	
Kimsguit.....	"	9,003	1,000	200	.....	10,203	
Bella Coola.....	"	8,654	.....	1,375	.....	10,029	
Smiths's Inlet.....	"	7,942	.....	.....	.....	7,942	
Totals.....		36,282	2,012	1,575	48	.....	39,917
Grand Totals..		228,232	12,342	19,864	9,411	269,849	269,849

BRITISH COLUMBIA FISHERIES, 1905—DISTRICT No. 2.

DISTRICT NO. 2.	VESSELS, BOATS, &c.										KINDS AND QUANTITIES OF FISH AND FISH PRODUCTS.				
	Vessels.			Boats.		Gill-nets.		Seines.		Trawls and Lines.			Salmon.		
	Number.	Gross tons.	Value.	Men.	Number.	Value.	Men.	Fathoms.	Value.	Fathoms.	Value.	Value.	Cases.	Salt, brls. \$10.	Dry salt, bc.
1 Skeena River.	13	600	63,000	60	641	57,205	2,561	160,400	85,496	250	850	114,085	1,400	150,000	1
2 Rivers Inlet	4	160	18,000	20	498	15,605	1,466	101,600	41,460	150	600	83,122	100	160,000	2
3 Naas River	3	120	4,500	10	180	16,470	696	40,000	16,600	.....	.....	32,725	120	100,000	3
4 North Coast	7	280	22,200	25	146	6,000	697	28,360	17,500	2,060	5,000	39,917	1,000	284,000	4
5 Queen Charlotte Islands	2	80	3,000	8	14	1,400	62	.....	.....	.....	.....	.....	400	90,000	5
Totals	29	1,240	110,700	123	1,479	96,680	*5,482	330,360	161,050	2,460	6,450	269,849	3,020	784,000	
Values												1,295,274	30,200	39,200	

* Including all cannery employees.

SESSIONAL PAPER No. 22

BRITISH COLUMBIA FISHERIES, 1905—DISTRICT No. 2—Continued.

KINDS AND QUANTITIES OF FISH AND FISH PRODUCTS.															
DISTRICT No. 2.	Salmon.			Herring.		Oulachon.			Canned Clams, (\$4.80) cases.	Trout, 10c. lb.	Mixed, 5c. lb.	Hair seals, 25c. lb.	Fish oil, 35c. gall.	Total Value of all Fish.	Number.
	Smoked, 10c. lb.	Fresh, 10c. lb.	Frozen, 5c. lb.	Salt and fresh, 5c. lb.	Smoked, 10c. lb.	Fresh, 5c. lb.	Salt, \$10. bbls.	Smoked, 10c. lb.							
1 Skeena River	60,000	100,000	163,100	4,000	2,000	10,000	100	1,500	8,000	10,000	300	1,000	1,000	642,388 00	1
2 Rivers Inlet	3,000	30,000		15,000						3,000	200	200	500	412,885 00	2
3 Naas River	80,000	20,000		7,000	1,500	450,000	2,000	3,000	2,000	10,000	400	1,000	1,000	220,236 00	3
4 North Coast	50,000	10,000		80,000			100	3,000	1,000	10,000	600	8,000	8,000	230,851 00	4
5 Queen Charlotte Islands ..		20,000		40,000	6,000				400	2,000	30,000	300	13,450	28,516 50	5
Not itemized														100,000 00	
Totals	193,000	180,000	163,100	145,000	9,500	460,000	2,200	7,500	400	16,000	62,000	1,800	23,990	1,634,820 50	
Values ..	\$ 19,300	18,000	8,455	54,925	950	23,000	22,000	750	1,920	1,600	3,100	450	8,396 50		
Estimate of fish not included in above													100,000 00		
Grand total													2,011,199 50		

6-7 EDWARD VII., A. 1907

RECAPITULATION

OF Yield and Value of Fisheries in District No. 2, British Columbia, for Year 1905

Kinds of Fish.	Quantity.	Price.	Value.
		\$ cts.	\$ cts.
Salmon, canned 48 lb. cases	269,849	4 80	1,295,274 00
" salted brls.	3,020	10 00	30,200 00
" dry salted lb.	784,000	0 05	39,200 00
" smoked "	193,000	0 10	19,300 00
" fresh "	180,000	0 10	18,000 00
" frozen "	169,100	0 05	8,455 00
Halibut "	1,098,500	0 05	54,925 00
Herring, fresh and salted "	146,000	0 05	7,300 00
" smoked "	9,500	0 10	950 00
Oulachon, fresh "	460,000	0 05	23,000 00
" salted brls.	2,200	10 00	22,000 00
" smoked lb.	7,500	0 10	750 00
Trout "	16,000	0 10	1,600 00
Mixed "	62,000	0 05	3,100 00
Hair seals skins	1,800	0 25	450 00
Fish oil galls.	23,990	0 35	8,396 50
Canned clams cases	400	4 80	1,920 00
Estimate of fish not included in above			100,000 00
			1,634,820 50

FISHERIES Capital invested in British Columbia, District No. 2, 1905.

Description of Property.	Number.	Value.
		\$ cts.
<i>Fisheries—</i>		
Canneries, wharfs, &c	31	542,500 00
Vessels	29	84,802 00
Boats	1,479	106,662 00
Gill and seine nets (fathoms)	330,360	161,800 00
Trawls and lines		1,500 00
Scows	95	19,000 00
Oil factories	2	9,000 00
Salteries	6	23,000 00
Total capital		948,354 00
<i>Employees in fisheries—</i>		
Fishermen and cannery workers	5,482	
Employed in vessels	123	
Total	5,605	

SESSIONAL PAPER No. 22

BRITISH COLUMBIA—DISTRICT No. 3.

DISTRICTS.	VESSELS AND BOATS.				FISHING MATERIALS.				KINDS OF FISH.					Number.			
	Vessels.		Boats.		Gill-nets.		Seines.		Trap-nets.		Lines.	Salmon, canned cases,	Salmon, dry-salted, lb.		Salmon, smoked, lb.	Salmon, fresh, lb.	Halibut, fresh, lb.
	Value.	Men.	Number.	Value.	Fathoms.	Value.	Fathoms.	Value.	Number.	Value.							
1 Nanaimo.....	15,500	18	98	5,880	196	5,200	4,160	1,800	2,700	.....	1,100	.....	485,000	48,000	220,000	130,000	1
2 Cowichan.....	4,000	5	30	1,800	60	1,650	1,320	300	450	.....	400	.....	256,000	32,000	185,000	125,000	2
3 Victoria.....	22,800	51	30	1,800	55	1,500	1,125	.....	.....	33	330,000	30,500	1,812,100	21,750	124,560	159,300	3
4 Alberni.....	8,500	8	38	2,280	131	2,958	2,218	450	675	.....	575	4,813	1,300,000	8,550	28,500	23,800	4
5 Clayoquot.....	8,000	7	35	2,250	91	3,200	2,400	300	450	2	20,000	4,596	.....	10,500	24,800	34,650	5
6 Alert Bay.....	4,000	4	24	1,450	56	1,750	1,275	1,850	2,775	.....	450	8,728	38,000	1,500	6,000	14,800	6
7 Quathiaska..	3,500	3	18	1,108	65	1,270	950	350	525	.....	375	2,388	.....	2,500	4,500	1,950	7
8 Comox.....	3,800	3	16	1,050	55	980	750	450	675	.....	350	.....	43,000	3,400	6,000	91,100	8
9 West Coast, Mainland.....	4,500	7	25	1,500	70	875	650	900	1,350	.....	225	.....	76,500	4,800	8,500	22,300	9
Totals.....	74,600	106	314	19,118	779	19,383	14,848	6,406	9,600	35	350,000	50,975	4,010,600	133,000	607,860	602,900	
Values.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	244,680	200,530	13,300	60,786	30,145	

BRITISH COLUMBIA—DISTRICT No. 3.

KINDS OF FISH AND FISH PRODUCTS.

DISTRICTS.	KINDS OF FISH AND FISH PRODUCTS.														TOTAL VALUE OF ALL FISH.	Number.	
	Herring, fresh and salted, lb.	Herring, smoked, lb.	Smelts, lb.	Trout, lb.	Cod, lb.	Mixed fish, lb.	Hair seal, No.	Fish oil, galls.	Fish guano, tons.	Clams, sacks, (125 lb each).	Oysters, sacks, (125 lb. each).	Crabs, doz.	Whale oil, galls.	Whale guano, tons.			
1 Nanaimo	3,950,000	68,500	55,000	230,000	140,000	274	48,500	180	850	250	500	\$ cts.	312,755 50	1
2 Cowichan.....	8,000	23,000	50,000	100,000	95,500	65,000	450	12,500	.....	1,100	200	400	.....	.....	71,642 50	2
3 Victoria.....	154,000	8,000	154,000	128,000	14,500	110,000	570	6,300	.....	300	400	600	.....	.....	299,603 50	3
4 Alberni... ..	28,500	5,000	.....	2,500	6,000	15,000	740	7,800	.....	1,200	80	150	8,400	75	106,472 40	4
5 Clayoquot. . .	30,000	4,000	.....	3,000	4,500	10,500	600	7,400	.....	150	50	100	.....	.....	33,733 30	5
6 Alert Bay.....	25,000	1,000	2,000	2,500	3,500	9,000	300	1,000	.....	100	70	110	.....	.....	47,619 40	6
7 Quathiaska.....	18,500	850	1,500	3,000	4,000	8,000	250	1,500	.....	125	50	114	.....	.....	15,114 40	7
8 Comox..... ..	28,000	3,800	2,500	5,000	7,000	10,000	450	3,800	.....	700	150	300	.....	.....	14,012 50	8
9 West Coast, Mainland	7,500	50,000	1,800	3,500	3,500	8,500	250	1,200	.....	400	90	400	.....	.....	14,242 50	9
Totals..... ..	4,249,500	164,150	211,800	302,500	368,500	376,000	3,884	90,000	180	4,925	1,340	2,674	8,400	75			
Values.	212,475	16,415	10,590	30,250	22,110	18,800	2,913	31,500	5,400	4,925	4,690	1,337	2,100	2,250		915,196 00	
Shrimps and prawns..... \$ 2,000 00																	
Abelomies and mussels..... 2,400 00																	
Estimate of fish not included.....																	
Fur seals.....																	
Grand total..... 1,345,748 00																	

SESSIONAL PAPER No. 22

RECAPITULATION

Of the Yield and Value of the Fisheries of District No. 3, British Columbia.

Kinds of Fish.	Quantity.	Price.		Value.	
		\$	cts.	\$	cts.
Salmon, canned.....Cases.	50,975	4	80	244,680	00
" dry salted.....Lb.	4,010,600	0	05	200,530	00
" smoked....."	133,000	0	10	13,300	00
" fresh....."	607,860	0	10	60,786	00
Halibut, fresh....."	602,900	0	05	30,145	00
Herring, fresh and salted....."	4,249,500	0	05	212,475	00
" smoked....."	164,150	0	10	16,415	00
Smelts....."	211,800	0	05	10,590	00
Trout....."	302,500	0	10	30,250	00
Cod....."	368,500	0	06	22,110	00
Mixed fish....."	376,000	0	05	18,800	00
Hair seals.....Skins.	3,884	0	75	2,913	00
Fish oil.....Galls.	90,000	0	35	31,500	00
Whale oil....."	8,400	0	25	2,100	00
Clams.....Sacks, 125 lb.	4,925	1	00	4,925	00
Oysters....."	1,340	3	50	4,690	00
Crabs.....Doz.	2,674	0	50	1,337	00
Whale and fish guano.....Tons.	255	30	00	7,650	00
Shrimps and prawns.....				2,000	00
Abelonies and mussels.....				2,400	00
Estimate of fish not included in above.....				95,000	00
Fur seals.....Skins.	13,798	24	00	331,152	00
Total.....				1,845,748	00

6-7 EDWARD VII., A. 1907

STATEMENT of the Capital invested in District No. 3, British Columbia Fisheries, 1905.

Description of Property.	Number.	Value.	Totals.
		\$	\$
Canneries, wharfs, &c		96,000	
Vessels	30	74,600	
Boats	314	19,118	
Gill and seine-nets, fathoms	25,783	24,548	
Trap-nets and traps	35	350,000	
Lines		6,325	
Whaling station, plant and wharfs	1	70,000	
Salteries	13	32,500	
Scows	32	14,350	
Oil factories and barges	3	13,000	
			700,441
Fur sealing—			
Vessels	37	370,000	
Boats and canoes		5,800	
Guns and equipments		17,800	
			393,600
Capital total			1,094,041

Employees in Fisheries.	Number.	Totals.
Fishermen and cannery employees	1,525	
On vessels	106	
		1,631
Sailors and hunters in fur sealing—		
Whitemen	188	
Indians	330	
		518
Total		2,149

SESSIONAL PAPER No. 22

BRITISH COLUMBIA SEALING REPORT, 1905.

Numbers.	Vessels.	License No.	Masters.	Tons.	CREWS.		Boats.	Canoes.	B. C. COAST CATCH.		CATCH OUTSIDE AREA OF AWARD.		EASTERN BEHRING SEA CATCH.		Totals.	Branded skins.
					Whites.	Indians.			Males.	Females.	Males.	Females.	Males.	Females.		
1	Ainoko.....	17	Wm. Delouchrey.....	75	6	17	2	8	122	123	.....	.....	264	138	402	2
2	Allie I. Alger.....	8	George Heater.....	75	8	27	2	13	.....	.....	.....	.....	340	303	888	.....
3	Carrie C. W.....	14	V. Gullin.....	92	7	29	2	14	.....	.....	.....	.....	387	314	701	.....
4	Carlotta G. Cox.....	4	J. Christian.....	76	21	.....	6	.....	80	204	68	287	39	110	788	.....
5	Casco.....	1	Wm. Munro.....	63	21	.....	6	.....	223	202	256	203	85	106	1,075	.....
6	City of San Diego.....	5	A. C. Folger.....	46	18	.....	5	.....	73	106	198	28	183	143	731	.....
7	Diana.....	3	A. B. Whidden.....	50	18	.....	5	.....	58	215	186	98	39	77	673	1
8	Director.....	15	R. G. Macaulay.....	87	8	26	2	13	.....	.....	.....	.....	293	329	622	.....
9	Dora Steward.....	17	R. E. McKeil.....	94	7	30	2	14	44	61	.....	.....	320	393	818	1
10	Eva Marie.....	9	V. Jacobson.....	77	9	28	3	12	81	65	.....	.....	298	393	837	3
11	Fawn.....	13	A. H. Olsson.....	69	Missing	.....	2	11	.....	.....	.....	.....	165	307	472	.....
12	Ida Etta.....	16	H. F. Brown.....	69	6	23	2	13	107	98	.....	.....	452	249	906	4
13	Jessie.....	10	J. Haan.....	48	7	24	2	13	134	117	.....	.....	468	361	1,080	.....
14	Libbie.....	6	W. Heater.....	93	8	26	2	16	148	127	.....	.....	416	464	1,155	2
15	Unbrina.....	11	John G. Searle.....	99	8	35	3	.....	140	111	181	146	89	86	753	.....
16	Vera.....	2	A. St. Clair.....	60	21	.....	6	.....	57	83	.....	.....	290	373	803	12
17	Victoria.....	12	W. D. Byers.....	63	7	22	3	11	.....	.....	.....	.....	192	110	302	3
18	Zella May.....	18	B. N. Balcom.....	66	8	22	2	11	.....	.....	.....	.....	.....	.....	.....	.....
				1,233	188	309	55	149	1,267	1,512	889	762	4,320	4,256	13,006	28
Indian catch (by individual Indians in canoes along this coast.																792
Total catch of Canadian vessels																13,798

NOTE.—The *Anapilca*, a schooner operated under provisional Mexican registry, brought in 379 skins September 13.

SUMMARY.

British Columbia coast catch.....	3,571
Catch outside area of award.....	1,651
Eastern Behring sea catch (vicinity of Pribyloff islands).....	8,576
Total.....	13,798

6-7 EDWARD VII., A. 1907

RECAPITULATION

OF the Yield of Fisheries in all British Columbia for the Year 1905.

Kinds of Fish.	Quantity.	Price.	Value.	Total.
		\$ cts.	\$	\$ cts.
Salmon, canned (48 lb. cases)	1,167,822		6,621,942	
" fresh or frozen lb.	8,456,960		837,241	
" smoked "	446,000	0 10	44,600	
" dry salted "	15,494,600	0 05	774,730	
" salted brls.	5,220	10 00	52,200	
				8,330,713 00
Halibut lb.	8,901,400	0 05		445,070 00
Herring, fresh and salted "	4,495,500	0 05	224,775	
" smoked "	183,650	0 10	18,365	
				243,140 00
Oulachons, fresh "	510,000	0 05	25,500	
" smoked "	9,500	0 10	950	
" salted brls.	2,350	10 00	23,500	
				49,950 00
Smelts lb.	391,800	0 05		19,590 00
Trout "	468,500	0 10		46,850 00
Cod "	668,500			37,110 00
Shad "	15,000	0 05		750 00
Sturgeon "	20,000	0 10		2,000 00
Mixed fish "	538,000	0 05		26,900 00
Fish roe "	30,000	0 05		1,500 00
Clams, preserved cans	19,200	0 10	1,920	
" (125 lb. sacks)	7,425	1 00	7,425	
				9,345 00
Oysters " "	2,054	3 50		7,190 00
Mussels, crabs, shrimps and prawns				5,737 00
Estimate of fish not mentioned above				200,000 00
Fish and whale oil galls.	184,390			63,696 50
" " guano tons	872	30 00		26,160 00
Fur seal skins No.	13,798	24 00		331,152 00
Hair " "	5,684			3,363 00
Total 1905				9,850,216 50
" 1904				5,219,106 90
Increase				4,631,109 60

SESSIONAL PAPER No. 22

RECAPITULATION.

Of the Capital invested in the Fisheries of the whole of British Columbia.

Articles.	Number.	Value.	Total.
		\$	\$
Fishing vessels.....	88	389,492	
" boats.....	4,793	305,780	
Gill-nets and seines, faths.....	806,643	524,598	
Trawls and lines.....		12,825	
Traps and trap-nets.....	38	370,000	
			1,602,695
Canneries for salmon, wharfs, &c.....	71		790,000
Salteries.....	23	61,500	
Cold storage.....	3	120,000	
Oil factories.....	6	57,000	
			238,500
Whaling stations.....	1		70,000
Fishing scows.....	277		63,350
Total.....			2,764,545
<i>Fur Sealing Fleet.</i>			
Vessels.....	17	370,000	
Boats and canoes.....		5,800	
Equipment.....		17,800	
			393,600
Total.....			3,158,145

EMPLOYEES IN FISHING INDUSTRY.

	Number..	Total.
Fishermen and cannery hands.....	17,251	
" in vessels.....	451	
		17,702
Seal hunters—		
Whitemen.....	188	
Indians.....	330	
		518
Total.....		18,220

APPENDIX No. 3.

ALBERTA.

ANNUAL REPORT ON THE FISHERIES OF ALBERTA.

EDMONTON, March 17, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit the usual report and statistics of the Fisheries of this district for 1905.

As stated in my preliminary report for the year, the season opened badly for fishermen, the weather being very mild, a good many fish were spoiled for sale to outside markets, but as a rule, the fishermen did not try to fish until conditions were favourable.

Competition for whitefish for shipment, principally for the American market, was very keen, and fishermen realized good prices for their catch, as high as eleven cents apiece being paid at Pigeon lake. Some of the Indian fishermen who had good stations made ten dollars a day. I am sorry to state, however, that the money received did not seem to benefit them much, as Overseer L. Ingraham Wood, of Pigeon Lake, reports to me, that at close of fishing season he visited all camps, and could see no evidence that the occupants had been recipients of large wages nearly all winter.

Starting from Edmonton in October, I drove to Red Deer, thence via Lacombe to Buffalo lake, and then across to Battle river and Dried Meat lake, from there to Wetaskiwin and Pigeon lake, thence back to Edmonton.

I was astounded at the settlement of all the country I passed through, good farm houses and farms well fenced, and the stacks of grain, gave ample evidence of the fertility of the land, and the prosperity of the settlers. I found on this trip many of the large creeks and small rivers, such as Battle river, Pigeon Lake creek, Stony creek and Meeting creek, either very low or altogether dry, I did not see any signs, however, of any fish being stranded in the creeks, all seemed to have found refuge in the lakes where most of the creeks have their sources.

The number of lakes and creeks in this part of the district, all full of running fish in spring, make it a difficult matter to protect them as strictly and efficiently as I would wish. The guardians have done all possible, by breaking up traps and dams, and by clearing creeks of brush and other accumulations to allow the fish to ascend the creeks to spawn. Their work has been of service, as coarse fish are plentiful all over this section of country. The fishing at Buffalo lake was very good, and lasted all winter, which is unusual. This fishing is all done with hook and line. The black bass put in Buffalo lake are supposed to be thriving, it must be some time before they will be numerous, and make a showing in a lake as large as Buffalo lake.

Leaving Edmonton again in end of October, I visited Lake Ste. Annes, and White Whale lake. I found it to be the universal opinion of old residents of Ste. Annes that this lake was now as well stocked as ever with whitefish.

It is to be regretted that as yet no one has been able to make a success of winter fishing in this lake, Guardian Beaupré tried at many places in the lake this past winter but met with very little success.

White Whale lake is becoming a very important fishing place. Fish are caught all winter and are improving in quality every year.

SESSIONAL PAPER No. 22

The Canadian Northern Railway will have their road in operation to White Whale lake this fall, this will open a market for the fish of White Whale lake summer and winter, and for Lake Ste. Annes in summer, and care will have to be taken that they are not overfished.

None of the whitefish lakes in this district could stand the fishing they get for three months in winter if it were continued all through the year.

Little Devil's lake will have to be cleared of the pike in it before it will again be a whitefish lake. These fish simply swarm in this lake and are increasing every year, I think it would be well to consider the wisdom of protecting pike in waters frequented by whitefish. Net fishing for pike for market is not carried on by any one. I am afraid that if something is not done to weed them out, they will at last exterminate the whitefish. As it is they certainly destroy large numbers of young whitefish every year. Pigeon lake suffers to a great extent from their ravages.

On return from Ste. Annes I visited lakes Pakan, Saddle, Floating Stone, Whitefish and Lac la Biche.

The fish in Whitefish lake are increasing owing to less fishing being done, many of the Indians having moved onto the reserve at Saddle lake. Only about a quarter of this lake is in the Indian reserve. So it is quite easy for the department to establish a close season in this lake, all the best bass are outside of the reserve line. I found out at Floating Stone lake that last season, 1904, a half-breed had in a very few nights in spawning season killed 900 fish. This shows this lake is not altogether fished out. The close season was rigidly enforced last fall, and I hope before long to report this lake as again well stocked with fish. The fish in this lake are of unusually large size, and generally very fat. The country about the lake is being settled up quickly, so the preservation of fish in it is of importance.

At Lac la Biche I found that cold weather had prevented any great catch of fish being made in close season. The lake freezing and breaking up constantly made it impossible to set nets.

During the winter some fishermen from Lake Winnipeg made a thorough trial of winter fishing in this lake but could not locate the fish, where they go to is a mystery. The lake swarms with fish in summer time.

A lake 'Finchwood lake,' northeast of Lac la Biche some 30 miles, was found to afford good winter fishing, and doubtless many others will also be found to do likewise. A railroad passing close to Lac la Biche, and a charter has been granted for one, will open up a great fishing country. The fish in all lakes in this section are very large and fine.

Opposite Pakan, 12 miles south, is Whitford lake which is drained by the Egg creek. For some years past there have been very few fish in this lake, now as a result of keeping the creek clear of traps, and protection during close season, the lake is well stocked with pike, which furnish a welcome change of diet to the settlers near it.

Beaver, Hasting, and other small lakes and creeks in the Beaver hills are all full of coarse fish and are well looked after by Guardian McKenzie.

Cooking Lake, 20 miles S.E. of Edmonton, and Gull lake 8 miles west of Lacombe, are both summer resorts for Edmonton people and others; cottages have been built, gasoline launches put on, and lots at both lakes command good prices. There is a constant demand from the frequenters of these lakes, who represent the chief citizens of Edmonton. Strathcona and Lacombe, to get some sporting fish like black bass put in these lakes, and I might state in this connection that from all over Alberta, north and south of the Red Deer river, I am constantly receiving letters asking to have lakes and rivers stocked with fish. These demands can only be met I think by the establishment of a hatchery in Alberta. Edmonton as the distributing point of three lines of railway, and the number of lakes in close proximity suitable for stocking, would seem to me as offering the most suitable site. By Edmonton I mean anywhere in the Edmonton district where suitable water could be had.

The regulations have been fairly well observed throughout the district. The damming of creeks, the making fish traps, and the use of small meshed nets and spears are the most common offences, The guardians have confiscated quite a number of the

6-7 EDWARD VII., A. 1907

two latter, and destroyed a large number of small dams and traps. It is almost impossible to secure convictions, as the offenders are chiefly foreigners who plead ignorance of our laws and language. I think the evil is abating but it would greatly assist me if fishery notices, printed in German, Russian and Galician, as well as in English, were issued by the department. If I might make a suggestion, it would be to have a small card printed with the close season stated and same information as contained on present fishery notices, and have these in the different languages I have mentioned, and ask the Dominion land agents throughout the district to give every homesteader a copy, then there could be no pleading of ignorance of the law. This plan I feel certain would greatly assist in the protection of our fisheries, and would also be appreciated by the majority of the settlers, who are, I think, willing to obey the regulations once they know them.

It is difficult for me, who have lived nearly all my life in the district under my charge, and who yearly take trips covering a large part of it, to refrain from enlarging on the great change that is taking place in the country and the rapidity with which it is being settled. This much I can say, that wherever I have been; I have found the settlers contented and pleased with their location, and as a rule enthusiastic over the soil and climate.

I mention this matter of settlement in order that you may realize the necessity for stricter and more protection, in order to maintain the fisheries of the district at their present standard. The greatest drain will be on the whitefish lakes; high prices for fish for export will cause them to be fished to their utmost. Give the fish a chance to spawn, and limit the fishing privileges in the lakes, and I think there is no reason to fear that the waters in the district will not hold their own.

I have the honour to remain, sir,

Your obedient servant,

HARRISON S. YOUNG,

Inspector of Fisheries.

SESSIONAL PAPER No. 22

ALBERTA.

RETURN of the Number of Fishermen, Boats, Nets, &c., the Quantity and Value of all Fish caught in the waters of Alberta for the Year 1905.

Number.	Districts in Alberta.	FISHING MATERIAL.						KINDS OF FISH.						Number.		
		Boats.		Gill-nets.		Hand lines.		Whitefish.	Pickerel.	Pike.	Tullibee.	Mixed and Coarse Fish.	Value.			
		No.	Value	Men.	No.	Fathoms.	Value								No.	Value
1	Lac La Biche	65	650	80	240	7,200	720	.....	.....	250,000	90,000	50,000	20,000	150,000	22,100	1
2	Lakes Heart, Whitefish and Saddle	28	200	54	136	4,080	400	.....	.....	64,000	.....	.....	.....	18,000	3,560	2
3	Lakes Beaver, Dried-meat and Buffalo	71	740	520	200	5,970	600	350	350	84,000	.....	161,000	.....	170,000	12,430	3
4	Pigeon Lake	30	300	85	420	12,600	1,260	.....	.....	250,000	2,000	2,000	.....	150,000	15,660	4
5	Lakes Conjurung, Gull and Little Devil	24	240	80	112	3,360	335	30	30	.....	.....	16,000	.....	8,000	640	5
6	St. Anne Lake	16	280	20	31	930	90	.....	.....	556,000	4,000	15,000	.....	2,000	28,190	6
7	White Whale Lake	20	200	80	240	7,200	720	.....	.....	312,000	1,000	1,000	.....	1,000	15,700	7
8	Lakes Bad, Jackfish and Baptiste	6	30	101	46	1,380	140	90	90	.....	500	9,000	50,000	1,000	1,815	8
9	Lac La Lune and Buck Lake	20	200	15	45	1,350	135	.....	.....	40,000	.....	20,000	.....	20,000	3,000	9
18	Saskatchewan and Battle Rivers and vicinity	14	140	200	100	3,000	300	250	250	5,000	.....	.....	.....	86,000	1,970	10
11	Lesser Slave Lake and vicinity .....	.....	.....	25	40	5,450	1,500	.....	.....	60,000	.....	.....	.....	10,000	3,200	11
	Totals	294	2,980	1,260	1,610	52,520	6,200	720	720	1,615,000	97,500	274,000	70,000	616,000	.....	.....
	Values .....	.....	.....	.....	.....	.....	.....	.....	.....	80,750	4,875	8,220	2,100	12,320	108,265	.....

APPENDIX No. 4.

SASKATCHEWAN.

REPORT ON THE FISHERIES OF SASKATCHEWAN BY INSPECTOR
E. W. MILLER, FOR THE YEAR 1905.

QU'APPELLE, SASK., April 1, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit the following report on the fisheries of Saskatchewan district No. 1, together with statistical return showing yield of fish, value, &c.

The past year has presented no exceptional features and normal conditions prevailed throughout the district. While no large increase has taken place in fishing by net and the number of regular fishermen remains fairly constant; many of the smaller lakes and creeks in the southern portion of Saskatchewan, which were formerly rarely visited by any one, are now much resorted to by angling parties and in the aggregate a great catch of fish is so made. Settlers from foreign lands are specially active in availing themselves of any opportunities to so pleasantly and cheaply vary their diet, and throughout the summer and the earlier part of the winter a good fishing station is generally occupied.

Owing to the enforcement of the close season and the non-issue of netting licenses for small lakes and creeks which might otherwise be soon cleared out, the supply of fish remains practically constant and with the continuance of preventive measures against destructive methods of fishing, there is no reason to fear any depletion of our waters. In some instances parties feel aggrieved that they are unable to obtain net licenses for small lakes and creeks, but in this matter the interests of the public at large have to be considered before profit to individuals.

In the large lakes of the Saskatchewan River country where fishing for export is carried on, the results were mostly very satisfactory. In the Prince Albert district, however, while there was no lack of fish, the same difficulty that has occurred in previous years, prevented a satisfactory output. Under the domestic license system, it appears impossible in this district to secure such a regular prosecution of the industry by the local fishermen as will ensure the successful handling of an export trade. For a profitable business it is necessary that the parties providing outfits, arranging for the teaming of the fish from the lakes, &c., shall be able to rely upon a steady pursuit of the fishery by the men at the lakes during the season. On account of the difficulties of transport, the fishing is confined to the winter season, and the men taking it up do so but temporarily, with the result that the catch is very fluctuating and so uncertain as to deter buyers entering the market. Further north a full supply of fish is reported in all the lakes. Efforts are being made to form a local company to fish these waters which can certainly yield immensely more than sufficient for the local needs, which at present is all that is asked from them.

At Cumberland, the sturgeon fishery was again successfully prosecuted, the catch being made principally with the gill-nets of the local fishermen. The fish were bought by the Northwest Fish Company who also operated three pound-nets but without any large measure of success. The winter fishery was purely for home consumption, to supplement the supplies derived by the Indian and half-breed residents from hunting.

SESSIONAL PAPER No. 22

At Moose lake where the catch of the preceding winter had been phenomenally good, little was done in the summer, but all the netting allowed was worked this winter. The catch was larger in the aggregate though individual fishermen have not succeeded so well. The whitefish which form the great bulk of the catch here were again exported by way of Mafeking on the Canadian Northern Railway, to which point a team haul over the ice of from 100 to 120 miles was necessary. More applications for licenses on this lake were received than could be granted for it, and there was some friction accordingly, one man, a non-resident, being fined by the overseer for persisting in fishing without a license. The men with their supplies who intend to fish here in the winter have to be taken in by boat in the open water season. This fall in consequence of the very early and unexpectedly severe frost in October, much difficulty was experienced in getting on the grounds and many of the men were late in beginning work. While heavier catches are made on the newer and farther locations, there is a set-off in the additional cost of haulage to rail head and, roughly speaking, it may be stated that freight to Mafeking costs nearly half the value of the fish delivered at that point.

Cedar lake has been fished for the market both summer and winter, with very good results. In the summer fish are taken out by High Portage and over Lake Winnipegosis: in winter by the Mafeking route. The summer catch of fish in the Cumberland lakes is also brought out by the Saskatchewan River and Cedar Lake route. Pound-nets were operated here by the Northwest Fish Company with much better results than at Cumberland.

In all these northern lakes, where an export fishery is conducted the rights and interests of the resident population have been carefully watched, and the amount of fishing allowed in any one lake regulated to its capacity as far as possible. A railway to reach the Saskatchewan river at The Pas is now under construction, and its completion will give a considerable impetus to the fishing industry in the numerous lakes north of that point, all of which are reported as well stocked with splendid fish.

In the Nelson river district, the results of the work in the preceding year had proved that fish could not be transported that distance in the winter season remuneratively. Fishing in the winter of 1904-5 was, therefore, wholly confined to the food supply of the residents. Active operations were carried on by the Nelson River Packing Company through the summer with satisfactory results, in Playgreen Lake and the lower expansions of the Nelson river. Pound-nets were experimented with such poor success that their use was abandoned. The catches in gill-nets proved, however, that there was no diminution in the supply of fish, both sturgeon and whitefish being plentiful.

It is to be regretted that a suspension of the winter industry was found necessary as it afforded a profitable occupation to many of the Indians of that district.

In the Qu'Appelle lakes, the comparative scarcity of tullibee, owing to the great mortality among them reported last year, still continued. The supply of pike, pickerel and mullet remains extremely abundant and many fine fish of the first species were captured exceeding twenty pounds weight. Whitefish appear to be increasing slowly though the catch of them remains very small in comparison to that of early years. The amount of angling done in these lakes is very large and probably more fish are taken by hook and line than in nets. These lakes have more than lost the water gained last year and are now extremely low owing to the sweeping out of the river channel by the flood of 1904. The repair of the Katopwe dam is very necessary to prevent a recurrence of the bad conditions existing here before its construction. At Crooked and Round lakes lower down the Qu'Appelle valley, conditions are very similar, the increased number of anglers being very marked, and a few more net licenses were also issued.

At Long lake, where the whole surrounding district has been now well taken up, there was a large increase in the number of net licenses. In nearly all cases, however, these were taken out by settlers for the purpose of supplying their own needs and only a very few men fish for the purpose of supplying the general market. In consequence of the rise of water this lake is now in capital condition and appears well able to meet the demand on its fish resources. The whitefish here are of remarkably fine size, aver-

6-7 EDWARD VII., A. 1907

aging fully five pounds. A dam has been built on the Qu'Appelle river near the outlet from the lake, which will, it is expected, keep the lake at nearly its present level. Before the high water of 1904, its waters had fallen very low and the effect was beginning to be apparent in the falling off of the fishery, the absence of the younger and smaller fish being very noticeable in all catches.

In the trout districts of Southern Alberta the alteration of the close season has given general satisfaction. The rapid increase of population has necessarily led to a larger amount of fishing being done and in particular districts it is to be feared that some of the streams are being overfished, but it is difficult to see how a limitation can be placed on angling other than by shortening the season. There were rumours as to the use of dynamite, but no case could be authenticated.

In the Battleford district an increased amount of fishing was done at Turtle, Jackfish and Cold lakes, and the rush of settlers to this district will assuredly lead to the fishing here being carried on in a more systematic manner than hitherto. There is a splendid supply of fish in these lakes and a much larger catch will cause no detriment.

On the whole it is evident that the observance of the close seasons has been successful in preventing any undue depletion of our waters so far, and while fishing is confined to the authorized methods and times, there is reason to believe that the yield in these waters would be much larger than hitherto.

I am, sir,

Your obedient servant,

E. W. MILLER,

Inspector of Fisheries.

SESSIONAL PAPER No. 22

SASKATCHEWAN.

RETURN of the Number of Fishermen, Tonnage and Value of Tugs, Vessels, Boats, Nets, etc., and the Quantity and Value of all Fish in District No. 1, Northwest Territories, Province of Saskatchewan, for the Year 1905.

Number.	Districts.	FISHING MATERIAL.										OTHER FIXTURES USED IN FISHING.				Whitefish, lb.	Trout, lb.	Pickarel, lb.	Pike, lb.	Sturgeon, lb.	Perch, lb.	Tullibee, lb.	Mixed and coarse fish, lb.	Caviare, lb.	Value.	Number.
		Tugs or Vessels.		Boats.		Gill-nets.		Pound-nets.		Freezers and Ice Houses.		Piers and Wharfs.														
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Value.	Number.	Value.	Number.	Value.													
		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$													
1	Qu'Appelle	...	...	...	75	6000	900	...	...	...	...	...	53000	...	110000	175000	...	...	18000	30000	...	...	13,850	1	
2	Macleod	...	...	...	30	600	400	60	...	...	...	...	1000	3500	5000	10000	...	...	...	5000	...	...	2,710	2	
3	Battleford	...	...	...	35	7500	825	...	...	...	...	...	160000	20000	20000	30000	1000	...	...	3000	...	...	11,700	3	
4	Prince Albert	...	...	...	250	30000	3000	...	...	...	...	...	450000	20000	150000	200000	15000	...	...	5000	...	...	42,200	4	
5	Cumberland	1	6	15	3	160	1200	3	900	3	400	2	60	80000	5000	15000	50000	110000	...	5000	75000	...	...	19,150	5
6	Grand Rapids	2	45	6250	8	220	2700	12	3500	4	500	4	150	940000	45000	115000	120000	85000	10000	...	170000	2200	...	79,900	6	
7	Nelson	3	60	10000	17	300	30000	3250	10 2000	12	4000	...	...	200000	...	40000	50000	120000	...	2000	50000	2500	...	30,180	7
	Totals	6	111	17750	28	1070	129900	16735	25 6400	19	4900	6	210	1884000	105000	455000	635000	831000	10000	25000	410000	4700	...	...
	Values	...	...	...	...	...	...	...	...	...	...	...	...	113040	6300	18200	19050	33100	200	1000	4100	4700	...	...	199,690

APPENDIX No. 5.

MANITOBA.

REPORT ON THE FISHERIES OF MANITOBA FOR THE YEAR 1905, BY
INSPECTOR WM. S. YOUNG.

SELKIRK, MAN., March 15, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit herewith my annual report on the yield of the fisheries for the province of Manitoba and the unorganized territory called Keewatin for the year 1905, including statistics showing the number of men employed, the number of boats, nets, &c., their value and the varieties and quantities of fish caught.

The subdivisions of my district are the same as made in my last report and are as follows: Lake Winnipeg and its tributaries comprising the principal waterways, as the Nelson river, Playgreen lake at the north, Winnipeg river and its expansions flowing from the east, and Lake St. Martin rather to the northeast of Lake Manitoba, Lakes Rock, Pelican, Swan and Louise and a district formed of small lakes to the south and west of the province, the principal ones of which are Oak lake, Clearwater lake, near Riding Mountains; Whitewater and Lake Killarney, near Deloraine; Fish lake on the boundary line between Manitoba and Dakota.

The value of the yield of fish in my district for 1905 is \$1,503,615, which is an increase over the year of 1904, of \$37,625, although there is a large falling off in the catch of whitefish, 1,395,000 pounds, below the year 1904, a less vigorous prosecution of the fisheries during the year is one cause for the falling off in the catch, and in the second place, one of the large companies' license was cancelled, which put 20,000 yards of gill-net out of business for a part of the commercial season; and then in the third place, very few whitefish were caught during the winter season owing to the unfavourable weather.

While there was a considerable decrease in the catch of whitefish taken from the waters of Lake Winnipeg, there was also a decrease in the output from both Lakes Winnipegosis and Manitoba; the latter being closed in the summer season accounts for the decrease in the catch in that lake.

While there is a decrease in the catch of whitefish, pickerel, catfish and mixed and coarse fish, increases are noted in the catch of pike, perch, tullibee, sturgeon and fish used for home consumption.

Lake Winnipeg and its tributaries.

An examination of the statistics herewith inclosed will show a decrease in the quantity of whitefish caught of 1,000,000 pounds, and also a decrease in the catch of catfish of 50,000 pounds, increases are noted in the catch of pickerel of 250,000 pounds, pike of 25,000 pounds, and sturgeon (caviare) of 1,000 pounds, about an average catch of sturgeon, perch, tullibee, goldeyes, mixed and coarse fish, or fish used for home consumption noted. The total catch of fish for the year 1905 for Lake Winnipeg and its tributaries was 21,575,000 pounds and 36,000 pounds caviare, or the equivalent value of, \$1,112,625, which is an increase in value of \$63,625, over the preceding year.

SESSIONAL PAPER No. 22

Lakes Winnipegosis, Waterhen and Dauphin,

In this district a decrease in the catch of whitefish of 200,000 pounds, pickerel, 400,000 pounds, pike, 200,000 pounds, tullibee, 4,000 pounds, goldeyes, 2,000 pounds, is noted, mixed and coarse fish remain the same; the total yield for this district is 4,822,000 pounds, or a total value of \$225,770.

Lakes—Manitoba Shoal and St. Martin.

On the 13th day of March, 1905, an order in council was passed closing all the waters in this district to summer fishing, which dates from the first day of April to the thirtieth day of November in each year, both days inclusive. The action of the department in the closing of these waters was a popular one and I am sure will be a lasting benefit to the waters of this district. A number opposed the closing of the waters to summer fishing, but now, after the matter is settled, everybody seems to be well satisfied with the action of the department.

During the winter season of 1905 and 1906, those engaged in fishing through the ice report a profitable season. The largest yield in the history of the fisheries for this district is reported during the past winter season, which would go to show that the closing of the lake to summer fishing had a beneficial effect. The catch of whitefish shows a decrease of 200,000 pounds, pickerel of 200,000 pounds, pike or jackfish of 300,000 pounds, mixed and coarse fish of 500,000 pounds. Increases are noted in the catch of perch of 4,000 pounds, tullibee of 10,000 pounds, goldeyes of 2,000 pounds. The total catch in these waters is 3,682,000 pounds, or a total value of \$162,870.

The fish caught in the two latter districts, comprising the Pembina river and small lakes in the south of the province, are all used in the locality in which they are caught, so do not form any part of our export trade.

Summing up and for the purpose of comparison, we give the following:—

Year.	Lbs.	Value.
1904	32,954,000	\$1,465,990
1905	30,130,000	1,503,615
Decrease....	2,824,000	Increase.... \$ 37,625

While the decrease in the catch was very considerable, there was a decided improvement in the prices which helped to account for the larger amount realized for the season's operations.

SYNOPSIS OF FISHERY OFFICERS' REPORTS.

Overseer A. J. McPherson makes the following report on the fisheries of Lakes Manitoba, Winnipegosis, Dauphin and adjacent waters, for the year ending December 31, 1905.

The fishing on Lake Manitoba last season has been successful, notwithstanding its being closed for summer fishing. The catch has been well up to the average and the fish in good condition. Lake Winnipegosis fishing has been falling off somewhat, and the fish were very small in the north end of the lake. Over one-half of the whitefish caught during the latter part of the season only graded No. 2 and weighed less than two pounds per fish; this is accounted for by the fishermen constantly reducing the size of the mesh of their nets. In the south end of Waterhen lake, the fish were up to size and catches were very good. Close season has been fairly well observed by the fishermen, only ten men were fined for fishing out of season, but I have had considerable trouble with foreigners putting dams and fish traps on the small streams in the spring during the spawning season for pike and pickerel. Some of these contrivances are very ingeniously made and will catch fish while on their way up stream, and by reversing them will catch more when coming down stream after spawning.

Guardian James Matheson, of Moose Horn bay, reports on the northern end of Lake Manitoba, Fairford river, and Lake St. Martin, in which there was an increase in the catch of all kinds of fish throughout the year, the prices received were on the whole

6-7 EDWARD VII., A. 1907

very satisfactory, the year 1905 was by far the most prosperous year in the history of the fisheries for this district.

Guardian Skuli Sigfusson, of Maryhill P.O., Lake Manitoba, reports on the south end of Lake Manitoba and Shoal lake, the fishing in this district during the winter season was very satisfactory, large catches were made and good prices were received, thus making it a most successful season. The close seasons were well observed.

Guardian Wm. Hughes, Selkirk, Man., reports on the southern end of Lake Winnipeg and the Red river, at certain places he finds a decrease in the catch of fish, especially pickerel, at others about an average catch, the cause of the decrease was on account of the ice taking earlier than usual, and some fishermen lost most of their nets, and did not get started fishing again till late but all through the catch was about an average one, the catfish at mouth of rivers last summer were scarcer the water being very low and the fish did not come in as usual, the catch of pike and goldeyes was good, no abuses came to my notice, and the close seasons were observed throughout the year.

Guardian Joseph Polson, Winnipeg, reporting on the waters of the Red river in the vicinity of the city of Winnipeg, says that during the year 1905, twenty seine net licenses were issued also two domestic licenses for the waters of his district. The season was very favourable and the fishermen reaped a good harvest, and the catch was more than double that of the previous year. There was very little trouble among the fishermen this year; each man keeping his own ground, except one, and his case was speedily settled. He is not aware of any illegal fishing being carried on, as the men are now fully notified that they are being watched during the close season.

Guardian J. Magnusson, Nes, Man., reports that whitefish are getting scarcer every year and that the catch of pickerel last fall was less than in 1904, but that may be attributed to stormy and unsettled weather rather than to scarcity of fish, the close seasons have been fairly well observed, no fines have been imposed or confiscations made of fish or fishing apparatus in this district which comprises the Gimli district and Big Island on Lake Winnipeg, during the year.

Guardian T. B. Perry, Deloraine, Man., reports: I have made several official trips to the fish-producing lakes in my district during 1905 and have nothing of special interest to report regarding same. The fishing in my district is almost entirely carried on in Long lake and Lake Mitigastin; the greater part of the latter lake lies in the United States. The fishing is entirely carried on by settlers living near the lake, and the fish caught are pike and pickerel.

Guardian James Gray, Cartwright, Man., reports on the waters of Rock, Pelican, Swan and Louise lakes. He says: You are aware that no licenses were issued for the waters in this district. There appears to be an abundance of fish in above lakes, in fact trolling was a much used pastime as the fish were very plentiful during the year. I had occasion to remove many traps, principally across the rivers; these traps were solidly built with wire netting attached and at end of dam were traps. A canoe is badly needed in this work, as when driving you are away from rivers or lakes and obstructions are not seen. The Canadian Pacific Railway Company have constructed a fish ladder at Homefield, across the Long river which was badly needed.

As no complaints came from Oak lake, I had no cause to visit that vicinity during 1905. It is my intention to go from Rock lake down the Pembina river to the boundary line as I am informed there are dams made with poplar poles driven down through the ice in winter so as to be in position when the ice goes out.

In conclusion, I would just say that another report which I am preparing will contain some recommendations along the line of a more stringent code of regulations for the waters of Lake Winnipeg.

I have the honour to be, sir,
Your obedient servant,

W S YOUNG,
Inspector of Fisheries.

SESSIONAL PAPER No. 22

RETURN of the Number of Fishermen, Tonnage and Value of Tugs, Vessels and Boats, &c., in the Fishing Industry in the Province of
Manitoba and Keewatin for the Year 1905.

DISTRICTS.	FISHING MATERIAL.												OTHER FIXTURES USED.							
	Tugs or Vessels.			Boats.			Gill-nets.			Seines.		Pound-nets.		Freezers and Ice houses, Wharfs.						
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.			
1 Lake Winnipeg and its tributaries.	85	2540	250140	395	850	13000	1700	8500	510000	85000	21	700	600	10	2000	130	139000	40	12000	1
2 Lakes Winnipegosis, Waterhen and Dauphin.	3	95	18500	24	140	5475	290	3600	216000	36000						25	14100	13	4500	2
3 Lakes Manitoba, Shoal and St. Martin.					45	1500	240	1200	72000	12000										3
4 Lakes Rock, Pelican, Swan and Louise.					6	90	6	10	600	100										4
5 Lakes Oak and Clear Water.					4	60	4	6	360	60										5
Totals.	88	2635	268640	419	1045	20125	2240	13316	798960	133160	21	700	600	10	2000	155	153100	53	16500	

RETURN showing the Kinds, Quantities and Value of Fish in the Province of Manitoba and Keewatin for the Year 1905.

Number.	DISTRICTS.	KINDS OF FISH.										VALUE.	Number.	
		Whitefish, lbs., at 7c.	Pickarel, lbs., at 6c.	Pike, lbs., at 3½c.	Sturgeon, lbs., at 10c.	Perch, lbs., at 3½c.	Tullibee, lbs., at 3½c.	Gold Eyes, lbs., at 3½c.	Catfish, lbs., at 8c.	Mixed and Coarse Fish, lbs., at 2c.	Home consumption, lbs. at 3c.			Caviare, lbs., at \$1.
1	Lake Winnipeg and its tributaries	650000	450000	125000	60000	125000	180000	30000	50000	500000	100000	36000	1,112,025 00	1
2	Lakes Winnipegosis, Waterhen and Dauphin.	110000	140000	100000			14000	8000		100000	30000		225,770 00	2
3	Lakes Manitoba, Shoal and St. Martin	400000	100000	150000		19000	260000	3000		250000	250000		162,870 00	3
4	Lakes Rock, Pelican, Swan and Louise			20000							10000		1,000 00	4
5	Lakes Oak and Clear Water	5000		20000							10000		1,350 00	5
	Totals	8005000	6900000	3790000	600000	144000	2074000	311900	500000	6250000	1570000	36000		
	Total values	560350	414000	132650	60000	5040	72590	10885	40000	125000	47100	36000	1,503,615 00	

SESSIONAL PAPER No. 22

RECAPITULATION

Of the Yield and Value of the Fisheries for the season of 1905, in the Provinces of
Manitoba, Saskatchewan and Alberta.

Kinds of Fish.	Quantity.	Average Price.	Value.
		\$ cts.	\$
Whitefish..... Lbs.	11,504,000		754,140
Trout..... "	105,000		6,300
Pickrel..... "	7,452,500		437,075
Pike..... "	4,699,000		159,920
Perch..... "	154,000		5,240
Sturgeon..... "	931,000		93,160
" caviare..... "	40,700		40,700
Tullibee..... "	2,169,000		75,690
Catfish..... "	500,000		40,000
Goldeyes..... "	311,000		10,885
Coarse and mixed fish..... "	8,846,000		188,520
Total, 1905.....			1,811,570
Total, 1904.....			1,716,977
Increase.....			94,593

RECAPITULATION

Of the Capital invested in the Fisheries of the three Inland Western Provinces, 1905

Articles.	Number.	Value.	Total.
		\$	\$
Fishing tugs, 2,746 tons..... 457 men	94	286,390	
" boats..... 4,570 "	2,409	35,105	
			321,495
Gill-nets..... fathoms	981,380	156,095	
Seines..... "	700	600	
Pound-nets..... "	35	8,400	
Hand lines..... "	720	720	
			165,815
Freezers and ice houses.....	174	158,000	
Fishing piers and wharfs.....	59	16,710	
			174,710
Total.....			662,020

APPENDIX No. 6.

ONTARIO.

GENERAL REMARKS—FISHING SEASON OF 1905.*

The season has on the whole been a fairly profitable one for the fishermen, though the lakes were this year again visited by frequent and violent wind storms, which caused many suspensions of operations. Notwithstanding this, however, and that apparently fewer fish were caught than in 1904, prices were better, and from the fishermen's standpoint the outcome was nearly as good.

The total number of persons engaged in the industry in 1905, as reported by the overseers, was 3,247, as follows :

Lake of the Woods and Rainy River district, 140 ; Lake Superior, 184 ; Lake Huron and north channel, 359 ; Georgian bay, 315 ; Lake Huron (proper), 326 ; Lake St. Clair and Detroit river, 216 ; Thames river, 76 ; Lake Erie, 803 ; Lake Ontario, 516 ; Nipissing district, 44 ; inland waters, 276 ; 122 less than were employed in 1904.

The amount of capital invested was \$1,129,467, divided over the lakes as follows :

Lake of the Woods and Rainy River district, \$47,175 ; Lake Superior, \$86,775 ; Lake Huron and north channel, \$153,460 ; Georgian bay, \$295,628 ; Lake Huron (proper), \$103,762 ; Lake St. Clair and Detroit river, \$30,419 ; Thames river, \$955 ; Lake Erie, \$326,279 ; Lake Ontario, \$64,294 ; Nipissing district, \$24,000 ; inland waters, \$1,673.

There were in use 122 tugs valued at \$323,675, and 1,464 sail and other boats valued at \$299,498.

There were licensed 530 pound-nets ; 506 hoop-nets ; 27 fyke-nets ; 121 seines ; 130 dip-nets ; 3 machines ; 139 spears ; 13,000 hooks, and 3,910,528 yards of gill-nets, of a total value of \$1,130,800.

The total product of the fisheries amounted to \$22,572,300 pounds, the estimated value of which is \$1,708,963.

The principal species taken, and the quantity and value (including salted) were :

Whitefish, 2,895,820 pounds, \$289,542 ; trout, 6,170,850 pounds, \$617,085 ; herring, 5,232,200 pounds, \$261,610 ; pickerel (doré), 3,236,940 pounds, \$323,694 ; pike (including blue pickerel), 1,479,900 pounds, \$59,196 ; sturgeon, 401,350 pounds, \$32,108 ; caviare, 17,100 pounds, \$11,970 ; bladders, 290 pounds, \$232 ; eels, 20,150 pounds, \$1,209 ; perch, 800,200 pounds, \$24,006 ; catfish, 370,450 pounds, \$29,636 ; coarse fish, 1,939,600 pounds, \$58,188 ; tullibee, 7,450 pounds, \$447.

The total catch shows a decrease of 1,437,670 pounds, and a decrease in value of \$84,561, as compared with that of 1904.

The waters showing a decrease are : Lake Huron, north channel, 1,749,692 lbs.—there being a falling off in the quantity of every kind of fish taken ; the Georgian bay, 474,433 lbs. ; Lake and River St. Clair and Thames river, 102,260 lbs. ; Lake Ontario, 171,159 lbs. ; and Nipissing district, 26,000 lbs. Those showing an increase are : The Lake of the Woods, 262,098 lbs. ; Lake Superior, 149,348 lbs. ; Lake Huron (proper), 65,050 lbs. ; and Lake Erie, 595,795 lbs., the catch of herring and yellow pickerel in Lake Erie showing an increase of 370,800 and 628,270 pounds respectively.

* NOTE.—These statements are taken from the Provincial reports.

SESSIONAL PAPER No. 22

The total yield in the Lake of the Woods and Rainy river district was 1,017,420 pounds valued at \$91,707 ; Lake Superior, 2,647,820 pounds, valued at \$254,178 ; Lake Huron, N.C., 2,689,720 pounds, valued at \$259,668 ; Georgian bay, 2,509,030 pounds, valued at \$239,503 ; Lake Huron (proper) 2,045,430 pounds, valued at \$173,211 ; Lake St. Clair and Detroit river, 740,190 pounds, valued at \$33,313 ; Thames River, 182,590 pounds, valued at \$8,256 ; Lake Erie, 7,318,230 pounds, valued at \$437,352 ; Lake Ontario, 2,796,360 pounds, valued at \$163,584 ; Nipissing district, 368,800 pounds valued at \$34,740 ; inland waters, 256,710 pounds, valued at \$13,451.

FERTILIZING LAKE TROUT EGGS.

In a former report the enormous loss of spawn of the lake trout by the taking of those fish at the spawning period was referred to, and it was recommended that steps be taken to prevent a portion at any rate of the serious waste. It was pointed out that the State of Wisconsin had enacted that the fishermen should during the spawning period take the eggs from the female trout while alive, and the milt from the male trout while alive, and after mixing them together in a pail or can immediately cast them into the water from whence such fish were taken ; and it was suggested that our fishermen might in their own interests readily adopt this means of assisting in maintaining the fish supply. The practice has been followed for some years in Wisconsin, and with, it is reported, very satisfactory results. Indeed, it was believed that the planting of eggs in this manner was of more benefit than the close season, and that as large a percentage of them would hatch as in the hatcheries. This is the opinion of one at least of the best fish culturists in the United States. The expense of placing a few experienced men upon the tugs of fishermen operating in Lake Superior, where the trout spawn nearly if not quite a month before the season closes, would not be great, and there is no reason why a plan which has yielded such gratifying results in Wisconsin should not be equally successful here. The fisherman would no doubt be glad to afford every facility for carrying on the work. It is also the plan adopted by some of the States for securing ova for their hatcheries,—that is by sending men to accompany the tugs, and it has proved to be a much less costly and troublesome means than that of operating nets on their own behalf for the purpose.

THE WORK OF CAPTURING AND DESTROYING COARSE FISH IN THE NEPIGON.

The work of capturing and destroying coarse fish in the River Nepigon was again prosecuted ; 7,632 pike, 2,282 suckers, 228 pickerel (or doré), and 145 whitefish were destroyed and otherwise disposed of. The work was all done within a period of six weeks, which gives an idea of the extent to which these fish have multiplied in the Nepigon, and what a menace they are becoming to the trout of that famous river.

THE CARP.

The popular prejudice against the carp—a prejudice which has arisen because of its injury to other and finer species of fish, their spawn and young, and to the feeding grounds of the wild duck, increases as its destructiveness and depredations become more generally and widely known.

It is in the waters of Lakes Erie and St. Clair that it has multiplied and grown most rapidly, and is to be found in greatest numbers in this province. But it is by no means confined to these lakes, for we find it in considerable numbers in the cold, deep waters of the Georgian bay, the north channel and Lake Huron, Lake Superior seeming not yet to have been invaded.

As an example of the prolificness of the carp, it may be said that one weighing 4 or 5 lbs. will contain on an average from 400,000 to 500,000 ova ; one of 9 lbs. 600,000 ; and from one of 16½ lbs. the amazing number of 2,059,750 eggs have been taken. A genius for mathematics has figured it out thus : If from the eggs of a carp weighing 4 or 5 lbs. two fish survive, from one million carp (half of them being females) the increase the first year would be one million fish ; for the first five years (on the compound

interest system) 64 million; for ten years 2,048,000,000; for fifteen years 18,384,000,000.

The carp is a marvel of longevity. The New International Encyclopædia (1902) states that it 'may reach an age of 200 years;' and as for its vitality, Norris, in 'The American Angler's Book,' new edition, (a work of 700 pages) in the chapter 'General Remarks on Fish' makes the almost incredible statement (page 48) that 'it is an established fact that in draining carp ponds in Germany to cultivate the soil which had been flooded and made a fish pond of for the purpose of enriching it, the spawn of the carp left after drawing off the water does not lose its vitality though exposed for two or three years to the heat of summer and frost of winter; and that when the field is again converted into a pond there is no necessity of restocking it with carp, but the ova remaining beneath the surface of the ground produces a stock of carp, thus keeping up an alternation of crops—fish and vegetables.'

The editor of 'Forest and Stream' in a recent article said: 'In the great lakes it is in the very nature of the case a matter of international concern, and it is a concern which every year is becoming more serious, as the fish multiplies in its old haunts and finds its way into new waters.'

The carp is here, and it is here to stay. To extirpate it from connecting water courses is something which may safely be counted as beyond the ingenuity of man.'

In Illinois there is a small lake into which the carp had found its way. The lake had once been famous for its game fish, and the work of ridding it of these 'scavengers' was begun, but after more than 40,000 pounds had been taken the effort was abandoned as hopeless.

While therefore it would appear to be impossible to exterminate the carp from waters in which it has already become established, it is not too late to protect therefrom the more or less isolated waters which have not yet become invaded by it. Our law prohibits the taking of fish in any manner from provincial waters for the purpose of stocking, artificial breeding, or for scientific purposes, without the authority of the department in writing; so that unless carp are illegally deposited therein, these waters are safeguarded to that extent. And in this connection let a word of warning be sounded, and that is in regard to the erection of fishways, which are constantly being recommended and asked for in dams throughout the province. In many cases these dams are now so many fortresses guarding our inland lakes from the enemy, while, if fishways were erected, facility would be afforded for the enemy to enter, and it would be but a short time before it would drive out and supplant all other fish. Much better would it be to discourage the fishways and stock the waters by the introduction of bass, trout or other game or desirable and suitable fish.

It is uncertain when the carp was first introduced into American waters. From an authentic source we find that in the years 1831 and 1832 an enterprising New Yorker brought 'from France' some six or seven dozen which he put into his ponds, and from these ponds he made frequent plantings into the Hudson river, where they are said to have 'thrived wonderfully.' The introduction by the United States Fish Commission was begun in 1877. The first lot brought over consisted of 345 fish, of which 227 were mirror, and 118 scale carp. These were planted in ponds, and in 1879 their progeny, amounting to some 12,265, were distributed to over 300 persons in 25 states and territories. From 22 applicants for carp in 1877, these had increased to 2,000 in 1880. In 1882 over 7,000 applications were received by the commission, of which 5,758 were granted, 143,696 fish being distributed, some of which 'were sent to Canada.' In 1883, 260,000 were distributed in 1,478 counties, and to nearly 10,000 applicants. The distribution was carried on until 1897, when it was discontinued. So that from these plantings the public waters of this continent during the short period of about 25 years are now literally overrun with this fish. In 1883 the fishermen of Lake Erie began to take them in their nets. They did not know what they were, and they were kept on exhibition in tubs as curiosities.

When the question of the introduction of carp into the United States was being considered by the Fish Commission, Prof. Baird, the then commissioner, in his report for 1873-4 enumerated the good qualities of the carp which made it 'a desirable species for cultural purposes,' as follows:

SESSIONAL PAPER No. 22

1. Fecundity and adaptability to the process of artificial propagation.
2. Living largely on a vegetable diet.
3. Hardy in all stages of growth.
4. Adaptability to conditions unfavourable to any equally palatable American fish, and to varied climates.
5. Rapid growth.
6. Harmlessness in its relation to other fishes.
7. Ability to populate waters to their greatest extent.
8. Good edible qualities.

It has certainly been demonstrated beyond peradventure that it is 'hardy' and 'rapid' of growth, and has 'ability to populate waters to their greatest extent;' but it is doubtful if any considerable number of persons could be found to testify as to its being 'harmless in its relation to other fishes,' and as to its 'good edible qualities.'

It would be a waste of time to discuss the unwisdom of the introduction of the carp, but that a great mistake was made there surely can be no difference of opinion. But 'it is here to stay,' and we must make the best of it. It has been shown that efforts for its extermination have been abortive. Some have suggested that the Government should offer a bounty to induce more people to fish for it. But the best bounty that can be offered is the increasing demand for it in the market. The demand that will make fishing for carp a profitable business will provide the necessary incentive for its capture, and there seems to be an increasing demand in all large American cities where there is a mixed population, and where the better kinds of fish, even for the wealthy, are becoming a luxury. In such cities it will fill a large and increasing want; but it will be some time before the people of Canada, who have been accustomed to our native fish, will cultivate a taste for the alien. The department should afford every facility for carrying on the work of capture that it is proper to afford, and authorize for that purpose the use of every implement, the operation of which will not be a detriment to or assist in the destruction of better species. When treating of the subject some years ago, we held the view that nothing short of concerted action on the part of the several jurisdictions surrounding the great lakes would have an appreciable effect towards permanently reducing its numbers. But this was before it had become to the same extent a mercantile product. The prices are increasing, and in the wholesale market of New York four or five cents a pound has been the average paid during the year, which would indicate a good profit to the fishermen. At certain periods of the year, however, prices are still higher, and by a small outlay provision may be made to retain the take until such time as can be more profitably disposed of. A simple and effective inclosure could be provided to accommodate almost any number of fish by selecting some sheltered spot or bay and running from the shore a picket fence (that which is manufactured and rolled in coils with wire if closely woven would suit the purpose) in a square or semi-circular form, the shore forming one side, the pickets being driven firmly into the ground, and supported at regular intervals by stakes or posts driven more deeply. A woven wire netting may where necessary be added to the top of the inclosure to prevent the fish from jumping out, and with a view to reducing the cost. It is not necessary to suggest that care must be taken to select a place for the pen where the bottom is free from stones and snags so that the fish when required to be marketed may be seined out; and it would afford greater immunity from damage to the inclosure from seas or floating debris if a boom were strung around the inclosure ten or twenty feet therefrom.

The net with which the carp may be taken most successfully is the seine. The gill-net, however, has its advocates, and may always be used to advantage where the carp has entered some place where the net may be set across its one means of escape, or where it may be driven into the net. And it can also be used in many places where it would be quite impossible, from the nature of the ground, to use a seine. A fisherman of experience with gill-nets offers the suggestion that No. 35 thread is of the proper strength, that a six inch mesh is the most profitable size to fish with, and that in making up the net it should be hung five in three—an expression which practical fishermen will understand. If taut, the fish will not enter the net, but will turn from it, it being very wary, 'wise, knowing and cunning.'

SESSIONAL PAPER No. 22

ARIO.

Vessels and Boats, &c., also the kind of fish, &c., for the year 1905.

KINDS OF FISH.											Value.	Number.
Herring, fresh, lb.	Whitefish, lb.	Trout, lb.	Pickeral or Doré, lb.	Pike, lb.	Sturgeon, lb.	Tullibee, lb.	Catfish, lb.	Mixed and coarse fish, lb.	Caviare, lb.	Bladders, lb.		
											\$	
.....	206,000	25,100	130,650	71,300	63,800	.....	59,050	.....	480	290	49,423	1
.....	90,820	4,500	113,030	21,500	.....	.....	.....	.....	.....	.....	21,695	2
.....	21,250	12,100	35,460	17,200	.....	.....	.....	.....	.....	.....	10,569	3
.....	10,000	6,000	.....	2,400	.....	.....	.....	.....	.....	.....	1,696	4
.....	13,000	5,500	.....	2,600	.....	.....	.....	.....	.....	.....	1,954	5
.....	4,000	.....	500	600	.....	.....	.....	.....	.....	.....	474	6
.....	3,000	2,500	300	750	.....	.....	.....	.....	.....	.....	610	7
.....	19,840	.....	10,000	8,500	.....	3,500	.....	.....	.....	.....	3,534	8
.....	.....	.....	.....	.....	.....	.....	10,600	.....	.....	.....	848	9
.....	.....	.....	.....	.....	.....	.....	11,300	.....	.....	.....	904	10
.....	397,910	55,700	289,940	124,850	63,800	3,500	80,950	.....	480	290	.....	.....
.....	39,791	5,570	28,994	4,994	5,104	210	6,476	.....	336	232	91,707	.....
.....
.....	176,800	†274,900	†1,058,750	19,250	300	.....	.....	2,500	.....	.....	152,707	1
.....	4,330	50,300	.....	.....	.....	.....	.....	.....	.....	.....	5,463	2
.....	5,200	4,400	6,800	.....	.....	.....	.....	.....	.....	.....	1,380	3
.....	4,000	30,000	.....	.....	.....	.....	.....	.....	.....	.....	3,400	4
.....	81,000	130,310	.....	.....	.....	.....	.....	2,300	.....	.....	21,200	5
.....	.....	10,000	.....	.....	.....	.....	.....	.....	.....	.....	1,000	6
.....	37,800	335,700	.....	.....	.....	.....	.....	7,200	.....	.....	37,566	7
.....	9,000	8,500	7,000	.....	.....	.....	.....	.....	.....	.....	2,000	8
.....	71,050	172,730	.....	.....	.....	.....	.....	2,800	.....	.....	24,462	9
.....	.....	30,000	.....	.....	.....	.....	.....	.....	.....	.....	3,000	10
.....	6,000	14,000	.....	.....	.....	.....	.....	.....	.....	.....	2,000	11
.....	191,000	491,980	1,845,590	19,250	300	.....	.....	14,800	.....	.....	.....	.....
.....	9,550	49,198	184,559	1,925	12	.....	.....	444	.....	.....	254,178	.....

† In No. 1, add 691 brls. trout and 158 brls. of whitefish valued at \$8,490.

6-7 EDWARD VII., A. 1907

ONT

RETURN of the Number, Tonnage and Value of Tugs, Vessels and Boats, and the
Province of Ontario,

Number.	DISTRICTS.	FISHING MATERIAL.										
		Tugs or Vessels.				Boats.			Gill-nets.		Pound-nets.	
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Yards.	Value.	Number.	Value.
	<i>Lake Huron (North Channel).</i>			\$			\$		\$		\$	
1	Tenby Bay.....					3	350	5	14,000	850	2	600
2	Marksville.....					3	425	6	16,000	450	2	600
3	Bruce Mines.....					7	1,450	16	18,000	800	12	2,500
4	Blind River.....	1	30	5,500	6	1	150	2	24,000	3,000	6	1,200
5	Cape Smith.....	1	25	2,000	5						10	3,500
6	Fraser's Bay.....	1	12	4,000	6	2	250	6			5	1,500
7	Haywood Island.....	1	12	4,000	6	2	250	6			5	1,500
8	Manitowaning Bay.....	1	12	4,000	6	2	250	6			5	1,500
9	Kagawong.....	1	15	2,000	5				24,000	2,000		
10	Clapperton Island.....					1	25	2	6,000	150		
11	Meldrum Bay.....	1	15	2,000	6				24,300			
12	Thessalon.....					1	150	2			4	100
13	Cockburn Island.....	1	20	6,000	6	3	1,000	7	36,000	1,900	2	400
14	Narrow Island.....					1	50	4	1,500	100		
15	Cutler.....					3	175	8	18,000	445		
16	Fitzwilliam Island.....	1	12	800	4	14	1,040	26	104,000	4,775		
17	Squaw Island.....	3	70	12,000	18	4	300	8	52,000	6,700		
18	Ducks Islands.....	1	15	3,000	5	5	450	10	54,000	3,000		
19	South Bay Mouth.....	1	20	2,500	5	7	1,050	15	66,000	3,900		
20	Killarney.....	1	15	2,000	6	21	1,450	42	150,000	7,500		
21	Bustard Islands.....	3	62	13,000	16	27	5,000	54	234,000	13,300		
22	Johns Island.....					5	250	11	30,000	1,000		
23	Aird Island.....	1	10	4,000	5	1	75				8	700
24	Providence Bay.....					1	50	2	6,000	200		
25	Cape Robert.....	1	25	2,000	6	1	100	2			5	1,500
26	Bedford Island.....	1	10	800	8						5	1,500
27	Lake Penage.....								2,000	200		
	Totals.....	21	380	69,600	119	115	14,290	240	879,800	50,270	71	17,100
	<i>Georgian Bay.</i>											
1	Parry Sound.....	5	9	15,725	35	13	1,835	23	124,250	14,980		
2	Waubashene.....					13	2,165	23	56,500	1,740		
3	Penetanguishene.....					14	500	25	46,750	1,045		
4	Collingwood.....	1	25	3,500	6	21	2,030	42	156,000	6,100		
5	Meaford.....	8	173	22,000	38	23	1,208	44	317,000	15,140		
6	Colpoys Bay and Tobermory.....	2	40	5,800	10	39	3,000	69	163,700	7,210		
	Totals.....	16	247	47,025	89	123	10,738	226	863,100	46,215		
	<i>Lake Huron Proper.</i>											
1	Cape Hurd to Southampton.....	11	225	31,000	47	41	4,810	87	525,300	38,808	2	300
2	Southampton to Goderich.....	2	44	4,400	12	4	500	8	79,200	935		
3	County Huron including Grand Bend	1	25	2,500	6	11	1,705	55	59,480	1,689	11	2,325
4	County Lambton including St. Clair River.....	2	3	3,800	6	71	4,800	105	64,000	2,300	64	10,750
	Totals.....	16	297	41,700	71	127	11,875	255	727,980	23,732	77	13,375

SESSIONAL PAPER No. 22

ARIO.

Quantity and Value of all Fishing Materials and the Kinds of Fish caught in the
for the Year 1905.

KINDS OF FISH.													Value.	Number.
Herring, salted, brls.	Herring, fresh, lb.	Whitefish, lb.	Trout, lb.	Pickeral or Doré, lb.	Pike, lb.	Sturgeon, lb.	Perch, lb.	Catfish, lb.	Mixed and coarse fish, lb.	Caviare, lb.	Trout, salted, brls.	Whitefish, salted, brls.		
													\$	
20		800	550	500	7,800				6,000				677	1
		1,300	2,400										570	2
		23,250	21,600	38,150	5,850	5,000			4,000				9,054	3
		16,000	120,000	26,000		2,800							16,376	4
		81,700	14,400	10,000	1,000	1,700							10,786	5
		12,800	7,200	18,600	2,500	600				30			4,029	6
		12,800	7,200	18,600	2,500	600				30			4,029	7
		12,500	7,200	18,600	2,500	600				30			4,029	8
		11,900	75,100	2,100	750								8,940	9
30													300	10
		12,000	11,400										2,340	11
			28,000										2,800	12
		16,000	196,600								27	10	21,630	13
40													400	14
140					800								1,432	15
15		60,200	149,200										21,190	16
		103,300	231,900	1,500									33,670	17
1		6,000	170,800										18,090	18
		35,200	104,000										14,090	19
10		79,700	97,200	27,700	2,500	500							21,100	20
80		157,800	117,700	96,900	17,900	5,900		400	1,000				39,620	21
40													400	22
		1,800	7,100	151,200		3,500			20,400				16,902	23
		2,000	1,000										300	24
8		6,900	6,200	38,600	1,200	2,500							5,498	25
		6,100	3,600	3,100	200	1,000							1,368	26
		80	300	100									48	27
394		660,430	1380,650	453,650	45,500	24,100		400	31,400	90	27	120	259,668	
5	35,520	187,240	246,420	28,400	14,500	2,800			20,000	300			49,596	1
11	3,900	30,050	26,300	104,370	36,600	2,200		450	31,200				18,929	2
22	2,080	24,370	25,800	8,000	4,000						155	73	8,471	3
	25,300	79,250	135,810	50		15,250	800	2600	1,400				24,490	4
		12,650	380,490								119		40,504	5
	7,000	60	137,970	300							7,900	433	97,513	6
38	73,800	333,620	952,790	141,120	55,100	20,250	800	3,050	52,600	300	8,174	506	239,503	
820	45,900	51,300	769,570	100	1,000	1,300	4,500			2,200			92,937	1
10	300	4,820	14,800										2,077	2
	56,800	11,300	105,050	20,600		3,200	1,600		300	4,900	1,250		17,885	3
	134,600	11,560	79,330	387,950	3,600	13,300	7,700	200	700	139,700			60,312	4
830	237,600	78,980	968,750	408,650	4,600	17,800	13,800	200	1,000	146,800	1,250		173,211	

SESSIONAL PAPER No. 22

and the Quantities of Fish caught in the Province of Ontario for the Year 1905.

KINDS OF FISH.										Value.	Number.
Herring, fresh, lb.	Whitefish, lb.	Trout, lb.	Pickeral or Doré, lb.	Pike, lb.	Sturgeon, lb.	Perch, lb.	Tullibee, lb.	Catfish, lb.	Mixed and coarse fish, lb.		
			37890	3850		200	500	1450	138700	\$ 8,256	1
1400	30800		82590	38200	24700	37700	3000	28700	493100	33,313	2
1400	30800		120480	42050	24700	37900	3500	30150	631800		
70	3080		12048	1682	1976	1137	210	2412	18954	41,569	
94800	17180		15200	23300	4500	6700		4900	24100	10,754	1
94000	62300		202400	168100	9900	202200		3150	126000	49,309	2
1058300	35250		402550	652800	15500	92500		800	144300	131,565	3
140610	24000		317300		6200	21100		1450	15600	42,922	4
613700	3600		31200	4000	600	23500		250	9600	35,561	5
334000	6400		55530		1900	4900		550	1800	23,325	6
217900	20000	200	162150	14000		68900		8650	142100	36,712	7
48600			59300		1400	200			4800	8,762	8
2300	20		25390	5900		36100		1100	94800	6,907	9
								14300	18600	1,702	10
257900	95200		289950	1500	6200	46200		100	64400	55,292	11
145300	40250		84550	66300	13300	32400		800	51600	27,025	12
7900	200		46500		14900	18000			5300	7,516	13
3015300	304400	200	1692020	935900	74400	552700		36050	703000		
150765	30440	20	169202	37436	5952	16581		2884	21090	437,352	

SESSIONAL PAPER No. 22

Quantity and Value of all Fish, Nets, &c., in the Province of Ontario—*Continued.*

KINDS OF FISH.												VALUE.	Number.
Herring, salted, brls.	Herring, fresh, lb.	Whitefish, lb.	Trout, lb.	Pickeral or Doré, lb.	Pike, lb.	Sturgeon, lb.	Eels, lb.	Perch, lb.	Tullibee, lb.	Catfish, lb.	Mixed and coarse fish, lb.		
												\$	
.....	436500	27400	9200	31070	2000	3100	.....	10900	50	2600	4100	29,581	1
2567	50940	30200	6800	500	20000	.....	2650	2500	.....	500	900	33,068	2
.....	116000	.....	3000	.....	.....	.....	.....	.....	.....	.....	.....	6,220	3
.....	7000	4300	8300	.....	.....	.....	50	.....	.....	.....	500	1,628	4
.....	58700	20300	1600	500	1100	50	.....	600	.....	250	24900	6,008	5
.....	15200	1500	.....	.....	450	.....	.....	.....	.....	.....	.....	928	6
.....	29500	7570	24850	.....	64300	.....	.....	18800	.....	12900	40300	10,094	7
.....	.....	.....	.....	.....	300	.....	.....	2800	.....	11300	2300	1,069	8
300	18300	92800	16400	1500	30300	400	400	12900	200	17300	40100	19,239	9
264	19940	103780	500	7830	30950	.....	6800	58200	.....	37500	91800	23,994	10
.....	3800	7600	.....	.....	33350	.....	5350	31900	.....	35600	12100	6,773	11
.....	8360	167260	3050	7550	8500	4250	.....	17400	.....	400	13600	19,846	12
.....	.....	10060	1400	.....	12700	6400	4000	23000	.....	17100	22400	5,136	13
3131	764240	472770	75100	48950	203950	14200	19250	179000	250	135450	257000	.....
31310	38212	47277	7510	4895	8158	1136	1155	5370	15	10836	7710	163,584	
17	11600	.....	570	.....	16306	.....	.....	4200	.....	28800	19200	4,465	1
77	660	.....	300	.....	16000	.....	.....	.....	.....	52650	32500	6,660	2
.....	.....	700	.....	1920	9200	5350	300	8400	.....	1700	25900	2,241	3
.....	.....	210	.....	.....	800	.....	.....	.....	.....	250	400	85	4
.....	39200	45620	2000	60960	25350	156750	600	3400	.....	.....	24200	34,740	5
94	51460	46530	2870	62880	67650	162100	900	16000	.....	83400	102200	.....
940	2573	4653	287	6288	2706	12968	54	480	.....	6672	3066	48,191	

6-7 EDWARD VII., A. 1907

ONTARIO

RECAPITULATION of the Number of Fishermen, Tonnage and Value of
and also the Kinds and Quan-

Number.	DISTRICTS.	FISHING MATERIAL.								
		Tugs or Vessels.				Boats.			Gill-nets.	
		No.	Ton- nage.	Value.	Men.	No.	Value.	Men.	No.	Yards. Value.
				\$			\$			\$
1	Lake of the Woods and Rainy River District.....	6	190	9,000	16	62	11,520	124	....	88,200 14,130
2	Lake Superior	18	212	43,300	98	77	6,895	86	....	448,800 25,190
3	Lake Huron (N. channel)....	21	380	69,600	119	115	14,290	240	....	879,800 50,270
4	Georgian Bay.....	16	247	47,025	89	123	10,738	226	....	863,100 46,215
5	Lake Huron (proper).....	16	297	41,700	71	127	11,875	255	....	727,980 23,732
6	Lake St. Clair and Thames River.....					139	4,202	292	*39	150
7	Lake Erie	41	716	104,950	228	331	36,997	575	*45	395,400 43,355
8	Lake Ontario.....	3	43	3,000	11	274	19,182	443	†139	499,640 20,756
9	Inland waters of Counties Frontenac, Leeds, Lanark, Prescott, Russell and Carleton and Nipissing District.....	6	20	7,100	20	214	5,199	292	....	7,608 920
	Total.....	122	2,105	325,675	652	1464	120,898	2,533	....	3,910,678 224,568

Number.	DISTRICTS.	Herring, salted, brls.	Herring, fresh, lb.	Whitefish, lb.	Trout, lb.	Pickeral or Doré, lb.	Pike, lb.
1	Lake of the Woods and Rainy River District.....			397910	55700	289940	124850
2	Lake Superior		191000	491980	1845590	19250	300
3	Lake Huron (north channel).....	394		660430	1380650	453650	45500
4	Georgian Bay.....	38	73800	333620	952790	141120	55100
5	Lake Huron (proper).....	830	237600	78980	968750	408650	4600
6	Lake St. Clair and Thames River.....		1400	30800		120480	42050
7	Lake Erie.....		3015300	304400	200	1692020	935900
8	Lake Ontario.....	3131	764240	472770	75100	48950	203950
9	Inland waters of Counties Frontenac, Leeds, Lanark, Prescott, Russell and Carleton and Nipissing District.....	94	51460	46530	2870	62880	67650
	Totals.....	4487	4334800	2817420	5281650	3236940	1479900
	Value	\$ 44870	216740	281742	528165	323694	59196

*Dip Nets. †Spears.

SESSIONAL PAPER No. 22

FISHERIES.

Tugs, Vessels and Boats, the Quantity and Value of all Fishing Materials, and the Quantities of Fish caught during the Year 1905.

FISHING MATERIAL.									OTHER FIXTURES USED IN FISHING.				Number.
Seines.			Pound-nets.		Hoop-nets.		Night Lines.		Freezers and Ice Houses.		Piers and Wharfs.		
No.	Yards.	Value.	No.	Value.	No.	Value.	No. Hooks.	Value.	No.	Value.	No.	Value.	
		\$		\$		\$		\$		\$		\$	
.....	.....	.....	12	3,500	31	3,725	.....	.....	10	4,200	3	1,100	1
.....	.....	.....	35	9,000	.....	.....	.....	.....	4	2,190	1	200	2
.....	.....	.....	71	17,100	.....	.....	.....	.....	10	2,200	.....	.....	3
.....	.....	.....	25	3,500	.....	.....	.....	.....	15	9,550	4	100	4
18	1,475	630	77	13,375	1	20	.....	.....	23	12,450	.....	.....	5
67	6,547	2,420	9	1,800	107	4,185	1,900	505	11	10,325	.....	.....	6
33	10,535	10,355	275	82,202	1	60	8,700	165	113	44,015	15	4,150	7
3	27,600	.....	*37	208	237	19,958	800	70	22	2,170	4	950	8
*1	2	.....	26	7,200	128	1,695	1,600	29	11	6,530	.....	.....	9
121	46,157	13,405	530	137,677	506	29,745	13,000	769	219	93,630	27	6,500	

Sturgeon, lb.	Eels, lb.	Perch, lb.	Tullibee, lb.	Catfish, lb.	Mixed and Coarse Fish, lb.	Caviare, lb.	Bladders, lb.	Trout, salted, brls.	Whitefish, brls.	Value.	Number.
										\$	
63800	.....	.....	3500	80950	.....	480	290	.....	.....	91,707	1
.....	.....	.....	.....	.....	14800	.....	.....	691	158	254,178	2
24100	.....	.....	.....	400	31400	90	.....	27	120	259,668	3
20250	.....	800	.....	3050	52600	300	.....	8174	506	239,503	4
17800	.....	13800	200	1000	146800	1250	.....	.....	.....	173,211	5
24700	.....	37900	3500	30150	631800	.....	.....	.....	.....	41,569	6
74400	.....	552700	.....	36050	703000	4260	.....	.....	.....	437,352	7
14200	19250	179000	250	135450	257000	.....	.....	.....	.....	163,584	8
162100	900	16000	.....	83400	102200	10720	.....	.....	.....	48191	9
401350	20150	802000	7450	370450	1939600	17100	290	8892	784	.....
832108	1209	24006	447	29636	58188	11970	232	88920	7840	1,708,963	

6-7 EDWARD VII., A. 1907

STATEMENT of the Yield and Value of the Fisheries of the Province for the Year 1906.

Kind of Fish.	Quantity.	Price.	Value.
		\$ cts.	\$
Whitefish.....brls.	874	10 00	7,840
".....lb.	2,817,420	0 10	281,742
Trout.....brls.	8,892	10 00	88,920
".....lb.	5,281,650	0 10	528,165
Herring.....brls.	4,487	10 00	44,870
".....lb.	4,334,800	0 05	216,740
Pickarel....."	3,236,940	0 10	323,694
Pike....."	1,479,900	0 04	59,196
Sturgeon....."	401,350	0 08	32,108
Caviare....."	17,100	0 70	11,970
Bladders....."	290	0 80	232
Eels....."	20,150	0 06	1,209
Perch....."	800,200	0 03	24,006
Catfish....."	370,450	0 08	29,636
Coarse fish....."	1,939,600	0 03	58,188
Tullibee....."	7,450	0 06	447
Total.....			1,708,963

Comparative Statement of the Yield of the Fisheries of the Province.

Kinds of Fish.	1904.	1905.	Increase.	Decrease.
Whitefish.....lbs.	3,474,300	2,817,420	.....	656,880
" (salted)....."	70,800	78,400	7,600	
Herring....."	4,252,580	4,334,800	82,220	
" (salted)....."	705,900	897,400	191,500	
Trout....."	6,275,430	5,281,650	.....	993,780
" (salted)....."	723,800	889,200	165,400	
Pickarel....."	2,632,540	3,236,940	604,400	
Pike....."	1,775,700	1,479,900	.....	295,800
Sturgeon....."	485,200	401,350	.....	83,850
Caviare....."	29,170	17,100	.....	12,070
Eels....."	45,500	20,150	.....	25,350
Perch....."	922,600	800,200	.....	122,400
Catfish....."	520,150	370,450	.....	149,700
Coarse fish....."	2,087,900	1,939,600	.....	148,300
Tullibee....."	5,800	7,450	1,650	
Bladders....."	2,600	290	.....	2,310
Total.....	24,009,970	22,572,300	1,052,770	2,490,440
Total decrease, 1905.....				1,437,670

SESSIONAL PAPER No. 22

RECAPITULATION

Of Fishing Tugs, Boats, Nets, &c., employed in the Province for the Year 1905.

Articles.	Value.
	\$
122 tugs, 2,105 tons, 652 men	325,675
1,464 boats, 2,533 men.	120,898
3,910,528 yards of gill-net.....	234,568
121 seines, 46,157 yards.....	13,405
530 pound-nets.....	137,677
506 hoop-nets.....	26,745
130 dip-nets.....	244
13,000 hooks on set lines.	769
219 freezers and ice-houses.....	93,630
3 machines.....	450
139 spears.....	139
27 Fishing piers and wharfs.....	6,500
Total.....	960,700

APPENDIX No. 7.

PROVINCE OF QUEBEC.

REPORT ON THE GULF OF ST. LAWRENCE DISTRICT BY INSPECTOR
WM. WAKEHAM, M.D., GASPÉ BASIN.

INLAND DISTRICTS, INSPECTORS A. H. BELLIVEAU, OTTAWA, AND
JOSEPH RIENDEAU, MONTREAL.

GASPÉ, January 20, 1906.

The Dominion Commissioner of Fisheries.

SIR,—I beg to submit the usual annual report and statistics of the Gulf Division Fisheries for the season 1905. The returns show a small increase in value over those for 1904—the actual increase is, however, much greater than that shown by our statistics, as the prices of nearly all kinds of fish ruled much higher than the values at which we have calculated them. Cod, which we value at \$4.50 per cwt., actually brought from \$5 to \$6. The same proportionate increase occurred in the case of herring, so that though the season was really a poor one, as far as the actual catch was concerned, yet to the fishermen, owing to the greatly advanced prices which they obtained, it really was one of the best they have had of recent years.

Spring herring struck in as usual about the end of April, and immense catches were made on the recognized spawning grounds, up to the middle of May. At the Magdalen Islands large numbers of vessels came from the Maritime Provinces, Newfoundland and the United States for their supply of bait, while many thousands of barrels were shipped to ports in the state of Maine where the herring are used in the smoke-houses. In the Bay des Chaleurs the greater part of spring herring taken is used to manure the land. This practice is objected to by many, more especially by those who are interested in the cod fishery, which is the staple industry of Gaspé and Bonaventure counties. Herring has certainly become more scarce and irregular along the shores of these counties, during the time of the summer cod fishery, than it used to be, and this scarcity of bait has caused a serious falling off in the cod fishery. All this is attributed by cod fishermen to the practice of using large quantities of herring and herring spawn for manure, and they say that the practice should be stopped.

For many years past I have inquired regularly into the condition of the spring herring fishery, and I cannot detect any diminution in the volume of the enormous schools which each spring frequent the spawning grounds. This being the case, I cannot bring myself to believe that the scarcity of herring bait in summer is due to any injury done by the spring catch, no matter for what purpose it may be used. All the world over, herring frequent certain well known spawning grounds, but once they leave these grounds after spawning their movements are often erratic and uncertain. The matter is, however, one which might engage the attention of the scientific branch of the service.

The cod fishery began at about the usual date in the spring, the middle of May; the fishery was, however, never good until late in the fall, when cod become very abundant. By this time most of the men had abandoned the fishing, and found work in the lumber camps, so that only a comparatively small number of boats engaged in the fall fishing.

SESSIONAL PAPER No. 22

Shippers became anxious, competition was keen, and the price of dried and even of green cod rose enormously, so that those who held on to the fishing did remarkably well. I know of several instances where men averaged \$10 a day for several weeks without any special exertion. This was particularly the case along the coast from Cape de Rosier towards Cape Chatte—herring had been fairly constant along this part of the coast all season, so that a supply of fresh bait being obtainable the fishery was better than elsewhere. This growing uncertainty of the fish bait supply in summer is compelling the fishermen to turn their attention to the storage of a supply in freezers.

The returns for the salmon fishery show an increase of over 300,000 lb., as compared with 1904. This occurred altogether on the north coast, was one of the best ever made. On some parts of the north coast almost phenomenal catches were made in the sea coast nets. On the south coast the fishing was poor both for netters and anglers—the fish were unusually late in running into the rivers, the bulk of the run took place after the fishing season was closed.

The returns furnished by the lobster packers show a considerable increase in the pack, this occurred mostly at the Magdalen Islands, where the summer catch was much ahead of that of 1904, very little was done there during the month's fishing allowed in the fall. On the mainland the pack continues to decrease. The pack for Bonaventure shows a slight increase, but it is a long way below the average of ten or fifteen years ago.

I would most strongly advise that the appliances for hatching lobsters at present in the Gaspé hatchery, be removed to some part of the outer coast, say Percé, Grand River or Port Daniel where a supply of eggs could be obtained, and placed in a lobster hatchery which should be run during the fishing season. This might help to keep up the lobster supply in the neighbourhood. Failing some help of this kind I think the time has surely come when lobster packing in Gaspé and Bonaventure should be stopped for a term of years.

The returns for the mackerel fishery show a considerable gain, 5,072 brls. having been taken as compared with 2,334 brls. for the previous season; this fishery is only prosecuted at the Magdalen Island as it is only at or about these islands that any regular fishing for mackerel is made in the Gulf division, elsewhere an odd mackerel may now and then be taken in the herring nets, but they are not found in sufficient numbers to warrant carrying on of a distinct fishery.

Dogfish were not as abundant as for the three previous years. On some part of the coast where we had been greatly bothered by them in past seasons, they did not appear at all. On the whole we did not hear much about them, though this may be largely due to the fact that the fishermen are getting accustomed to them, and have ceased to complain, having come to the conclusion that 'that which can not be cured must be endured.' I am, however, of the opinion that they are backing off again.

A whaling station was put in operation at Seven Islands, and though the whaling steamer was late in getting to work, and owing to the destruction by fire of one of the drivers, operations had to be suspended before the close of the season, yet some 66 whales had been captured and reduced at the works. This, under the circumstances, was not a bad showing.

Owing to the action of the Newfoundland government in restricting the supply of fresh bait to U. S. fishermen we had an unusual number of them on our Labrador coast, where they are by treaty allowed to fish. They came here because nowhere else could they find a supply of fresh bait, this bait in the shape of capelin they seize for themselves, they are all trawlers. Some conflict occurred owing to our local regulation prohibiting trawling within the three-mile limit. The regulation of course applies to our fishermen as well as to outsiders. It was instituted some years ago when U.S. fishermen were never seen on the Labrador.

I found that all of the U. S. fishermen who were on the Labrador had been furnished with copies of the treaty by which they are allowed to fish in the inshore waters of our Labrador, and that they had been instructed to be guided by the terms of the treaty. They were disposed to claim the right of fishing as they please, as our prohibition of

6-7 EDWARD VII., A. 1907

trawling was not mentioned in the treaty. On explaining the matter fully to all those I met, that trawling was not in vogue when the treaty was passed, that it applied to our own fishermen, and was passed as concerning them only, and not with the view of restricting the rights of U. S. fishermen, as they were not in the habit of fishing in our Labrador waters at the time, &c., I found no difficulty in persuading them to set their trawls outside the 3-mile limit, and all those who had set trawls inside removed them outside when asked to do so.

The masters of nearly all these vessels made no secret of the fact that they were driven to fish off Labrador, which they had abandoned many years ago for the Grand Banks, by the passing of the recent Act in Newfoundland, which made it difficult or even impossible to get the fresh bait which they required for the Bank fishery. This shows us pretty clearly to what an extent a regular and steady supply of fresh bait is necessary for the prosecution of the cod fishery.

With some minor exceptions the fishery regulations were well observed, and though, as I have said before, the actual catch of fish was small, with the exception of the salmon, yet prices were so high that the returns to the fishermen was as great as in a good year.

I have the honour to be, sir,

Your obedient servant,

W. WAKEHAM,

Officer in charge of the Gulf Division, P. Q.

REPORT ON THE FISHERIES OF THE INLAND DISTRICTS OF QUEBEC FOR THE YEAR 1905, BY INSPECTOR A. H. BELLIVEAU.

OTTAWA, March 1, 1906.

To the Dominion Commissioner of Fisheries.

SIR,—To better establish comparisons in the yields of the different kinds of fish with previous years, the former subdivisions have been, as much as possible, adhered to, even when under different officers.

Since the provincial authorities have ceased to exact from their respective officers the statement of the catch of fish in the inland districts, especially where little or no commercial fishing is carried on, it is almost impossible to secure any reliable data of fishery statistics. The fear of an increased license fee still prevents a great many fishermen from returning an accurate yield of fish.

South Shore districts.—In that part extending from Cape Chatte to Lévis on the south shore of the lower St. Lawrence, the fishery statistics have been collected by a Bounty officer in Rimouski and by two provincial officers in the six upper counties. The work seems to have been done carefully and the general yield of fish is much larger than the previous one, showing an increased value of over 100 per cent.

In the county of Rimouski this betterment is attributed principally to the large yield of cod, halibut and sardines. The 400,000 pounds of green cod are alone worth as much as the whole yield of the other fisheries in 1904. Sardines were plentiful and large captures were effected at Matane, Métis and St. Luce. The increase of the catch in this county alone amounts to nearly 300 per cent.

The same abundance prevailed in the two next counties, Temiscouata and Kamouraska, where four times the quantity of fish of the previous year has been returned. At Isle Verte alone, the value of the fisheries exceed the whole piscine product of these counties in 1904. This is due specially to the abundance of sardines and herring in this part of the St. Lawrence. Even salmon were plentiful, about 5,000 pounds being captured at Cacouna alone.

SESSIONAL PAPER No. 22

Eel Grass.—Although the fishermen of l'Isle Verte district realized over ten thousand dollars from the prosecution of their fisheries, during the summer months, their attention is diverted to another branch of marine industry which becomes quite a source of wealth to the fortunate riparian owners where eel grass grows. This long slim grass is cut at low tide and brought ashore in large boats and spread on the fields to dry. It is then shipped in bales to different cities and used for upholstering purposes. Over \$30,000 was realized last year from this marine product by the citizens of the locality. This particular growth is confined to a limited area between the island and the mainland. Its value is not included in our statistical statement, but it was thought worth mentioning.

In the upper districts of Berthier, Beaumont, Lévis and vicinity, the total value of the fisheries is about equal to the previous one. With the exception of eels which were not so abundant, the other species yielded as much and more than during the previous season. More salmon were captured.

This whole south shore district shows a fishery production valued at nearly \$117,000, while in 1904 it was only compiled at \$54,000.

North Shore district.—In that part of my division extending from Quebec to the Saguenay and including Lake St. John, there is but little change to mention. The total value of the catch slightly exceeds the previous one, but this is ascribed mostly to the larger estimate of salmon captured in the small bays and tributaries of the Saguenay, chiefly by poachers.

Besides the anglers' catch, perhaps over a hundred settlers provided with small nets come and claim their quota of salmon from the Saguenay for their own use and sometime even for sale. This number is not exaggerated as two years ago, the active guardian Mr. Maher, of Tadousac, seized over one hundred nets, showing the larger number of poachers. Last year only twenty-seven such nets were seized by the same fearless officer. Even settlers quite a distance from this remarkable stream come and borrow the net of an accommodating poacher and secure a supply of salted fish. It is claimed that one noted poacher alone disposed of hundreds of salmon to summer hotels, &c. It is seldom that the worst culprits are brought to justice as they are always masked and pursue their nefarious work in groups, rendering detection and identification almost impossible. However, a few prosecutions last summer proved effective. The mere seizure of a net is not sufficient punishment for such bold characters.

Lake St. John, which is the head water of the Saguenay, forms a part of the above mentioned division. The extensive net fishing attempted there in 1904 did not prove a profitable venture, and I am pleased to state that the provincial authorities have decided not only to curtail nets in this inland sea but to prohibit their use entirely. It will be a difficult task to prevent all the settlers, especially in the vicinity of the *décharges*, from using a net occasionally. It is claimed that very few ouananiche are ever caught in gill-nets. However, very few fish of any kind were shipped from the railway stations last year, but no doubt a small provision is made by the settlers residing in the vicinity of the ouananiche grounds. There is no doubt that this famous game fish is steadily diminishing, notwithstanding the efforts of the pisciculturists to restock its home, the tributaries of Lake St. John. As some nets were still allowed in 1905, the other kinds of fish such as pickerel, whitefish and coarse fish were still captured in fair quantities, to supply the local demand in Roberval and neighbouring small villages. The only netting tolerated in future in that lake will be by the few Indian families on the Blue Point Reserve not far from Roberval, for their own use.

In the other part of this district, the counties of Charlevoix and Montmorency, eels are the only fish remaining of any importance. Now, many of the numerous weirs around Ile d'Orleans are only set in the fall months for the eel catch, which, for last season, is estimated at 270,000 lb. A few stray salmon are now and then captured in these weirs, about 5,000 lb. in both counties.

Inland districts from Quebec to Pontiac.—The yield of these inland divisions prepared by Inspector Riendeau of Montreal and myself, is steadily falling off. The better grades of fish are giving place to inferior ones. The fish are smaller than formerly. Lake St. Pierre, the most important fishing ground of the district, is being depleted by excess-

6-7 EDWARD VII., A. 1907

sive hoop-net fishing, which should be either curtailed or better still, the lake should be set apart for a term of years as are Lakes St. Louis and St. Francis. Fishermen taking licenses for three or four nets have 15, 20 and 25 nets, and at times, they are nearly all in the water. This gross abuse should be remedied effectively by marking, in some way, every licensed implement to better enable the fishery officers to detect the illegal ones. The only rest the lake gets is during July and August, when netting of all kinds is prohibited. This federal regulation is fairly well observed, as very few fish are brought to Montreal markets from there during that hot period. There seems to be a great need of some sturgeon regulation to check the present abuse of immature fish exposed for sale publicly. In fact a minimum size should be prescribed for all species of fish that it is advisable to protect. When sturgeon of nine inches and the young of other species requiring twenty to the pound are sold openly, it is high time for the proper authorities to institute a protective measure.

The total value of the catch of these inland divisions is reckoned at nearly \$10,000 less than the previous one, which itself showed a large falling off. In many cases, the diminished catch does not prove a greater scarcity of fish, but a restricted mode of fishing. For instance, in the upper Ottawa or Lake Temiscamingue, the extensive netting which had been allowed in 1903 and 1904 was entirely prohibited for the benefit of the resident settlers of this now famous mining district. No netting is allowed in Lakes St. Francis and St. Louis, limiting the catch to night lines and angling. It is the intention of the provincial authorities to further limit seining and netting where they will not prohibit their use entirely. It will thus further decrease the general production of fish, but it will be to the benefit of the line fishermen. It will be better thus, as many localities that yield insufficiently for a commercial purpose, would afford amusement and recreation to a great many, who would be satisfied with a limited supply.

Missisquoi Bay and Richelieu River.—This bay and River Richelieu, the outlet of Lake Champlain, seem to withstand the annual drain of considerable fishing better than any other waters under my supervision. The refusal of New York State to receive fish from this locality, hampered the fishermen for a while, but other markets were soon found, and now it is questionable, even if the restrictions were removed, whether all the fish would again find Fulton market. The seiners of Missisquoi bay had a short season but did as well as usual; a good supply of pickerel and perch was secured.

The most extensive eel weirs of Canada, at Iberville, were again successfully operated and yielded fair profits to their owners who shipped mostly to Chicago instead of New York, on account of the petty prohibition of the neighbouring state.

A noticeable incident was the unusual abundance of black bass in the river, especially between the Lacolle and St. John bridges. It was not a rare occurrence for a couple of anglers to capture their two or three dozens in an afternoon's sport.

Eastern Townships.—The beautiful lakes of the townships are not sufficiently protected. Where there is no revenue derived the protection may somewhat suffer. Owing to the sad drowning accident in Lake Aylmer, in the beginning of the summer, when three lives were lost, which cast a gloom in the neighbourhood, there was less fishing indulged in than usual. There is still some poaching carried on, especially in Lake Memphremagog, which is over thirty miles long; the south end extending into the State of Vermont, allows the poachers a greater chance to dispose of their illegal gain. The best protected lake in that district is Massawippi, where a well-organized club takes interest in its protection.

Respectfully submitted,

A. H. BELLIVEAU,

Inspector of Fisheries.

SESSIONAL PAPER No. 22

PROVINCE OF QUEBEC—Gulf of St. Lawrence District.
Return showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., in the County of Bonaventure,
Province of Quebec, for the Year 1905.
RESTIGOUCHE SUBDIVISION (Tide Head to Maguacha).

Districts.	Fishing Vessels and Boats.				Fishing Gear or Materials.						LOBSTER PLANT.	
	Vessels.		Boats.		Gill-nets.		Seines.		Trawls.		Number.	Value.
	Number.	Tonnage.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.		
<i>Bonaventure Co.</i>												
1 Restigouche.....	22		\$ 400	70	20	4500	\$ 4000					1

BONAVENTURE SUBDIVISION (Maguacha to Paspébiac Point).

1 Maguacha and Nouvelle ..	60	1100	120	150	3000	1500	3	100	65			1
2 Carleton ..	155	2000	310	450	9000	4500	6	196	150			300 2
3 Maria ..	165	2200	330	500	10000	5000	5	150	125			3
4 New Richmond and Black Capes ..	95	1500	180	190	3800	1900						4
5 Capelin ..	215	3500	430	620	12400	6200	5	150	125			5
6 Bonaventure ..	340	6000	680	1200	24000	12000	50	1400	100			200 6
7 New Carlisle ..	56	800	112	120	2400	1200	12	400	400			7
8 Paspébiac ..	5	290	7500	30	4200	2100	60	1900	1500			8
Totals ..	5	290	7500	30	68800	34400	141	4290	4165	130	1600	3 750

PORT DANIEL SUBDIVISION (Paspébiac Point to Point Macquereau).

1 Hopetown ..	70	2100	92	70	1470	1168	11	275	300	37	850	650 1
2 Nouvelle ..	86	2550	142	80	1660	1420	12	300	325	30	750	2
3 Shigawake ..	50	750	67	65	1420	1150	8	200	240	15	325	320 3
4 Port Daniel ..	180	5350	265	350	7000	5500	25	625	800	125	1800	1550 4
5 Anse à Gascons ..	195	7800	295	400	8275	6800	16	440	650	160	2400	350 5
Totals ..	581	18750	861	965	19825	16038	72	1880	2315	367	6125	9 2870

6-7 EDWARD VII., A. 1907

RETURN showing the Kinds of Fish and Fish Products in the County of Bonaventure, Province of Quebec, for the Year 1905.
RESTIGOUCHE SUBDIVISION (Tide Head to Magnucha).

Districts.	KINDS OF FISH.												FISH PRODUCTS.				TOTAL VALUE OF ALL FISH.	Number.		
	Salmon, fresh, lb.	Herring, salted, brls.	Herring, fresh, lb.	Herring, smoked, lb.	Lobsters, pre- served in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod, tongues & sounds, brls.	Hadlock, fresh, lb.	Hadlock, dried, cwt.	Hake, dried, cwt.	Halibut, lb.	Trout, lb.	Smelts, lb.	Belts, brls.	Tom cod, or frost fish, lb.			Fish oil, galls.	Fish as bait, brls.
<i>Bonaventure Co.</i>																				
1 Restigouche.....	80500	550	..	..	..	..	160	..	..	..	..	..	..	77000	..	50000	..	2600	..	\$ cts. 25,945 00 1
BONAVENTURE SUBDIVISION (Magnucha to Paspebiac Point).																				
1 Maguacha and Nouvelle.....	10600	250	6000	2000	..	8	100	..	3000	..	..	..	1000	..	..	8	50	25	4500	6,287 50 1
2 Carleton	30000	400	8000	10000	550	25	70	..	2000	..	..	..	300	..	..	5	35	135	4000	11,610 50 2
3 Maria	35000	1000	8000	20000	..	40	125	..	4000	..	..	..	5000	1500	..	25	62	92	6000	16,844 10 3
4 New Richmond and Black Capes	20000	350	4000	2000	..	10	80	..	2000	..	..	..	10000	..	..	20	4000	25	3500	9,244 50 4
5 Capelin.....	..	800	6800	8000	5000	15	2000	2	5000	15	30	..	1000	..	..	5	1000	500	8000	19,627 50 5
6 Bonaventure	12000	900	7000	10000	6000	50	3000	4	15000	25	45	350	3000	4700	..	20	1500	800	10000	30,266 25 6
7 New Carlisle	800	750	5000	2000	..	20	200	..	2000	5	..	..	300	..	..	1	100	50	4000	3,807 50 7
8 Paspebiac.....	..	250	5000	4000	..	15	6000	8	10000	200	200	2000	1000	45000	..	3	3000	1500	5000	38,074 00 8
Totals.....	107800	4025	49000	58000	11550	183	11575	14	43000	245	275	2350	21600	51200	..	87	5787	3127	45000	135,701 85
PORT DANIEL SUBDIVISION (Paspebiac Point to Point Macquereau).																				
1 Hopetown.....	4000	300	..	3500	16320	..	2500	20	..	500	..	1500	..	..	..	4000	1800	350	2500	21,585 00 1
2 Nouvelle.....	2800	600	..	4500	..	..	3000	12	..	550	..	2800	..	..	..	..	2000	640	2500	21,710 00 2
3 Shizawake.....	..	500	..	5000	9000	..	1400	8	..	125	..	..	..	..	..	..	800	250	2800	13,370 00 3
4 Port Daniel	14000	1500	..	9000	30590	..	5000	15	..	800	..	3000	14000	..	..	..	2500	1350	3500	48,230 00 4
5 Anse à Gascons.....	6500	1800	..	..	500	..	6500	30	..	550	..	1000	..	..	..	25800	4000	2250	800	47,699 00 5
Totals	27300	4700	..	22000	6082	..	18400	85	..	2525	..	4500	6800	14000	..	29800	11100	4840	11600	152,594 00

SESSIONAL PAPER No. 22

RETURN showing the Number and Value of Vessels, Boats, Nets, &c., also the Kinds of Fish Caught in the County of Gaspé, Province of Quebec, for the Year 1905.

GRAND RIVER SUBDIVISION (Point Macquereau to Barachois).

DISTRICTS.	FISHING BOATS.			FISHING GEAR OR MATERIALS.								LOBSTER PLANT.		KINDS OF FISH.						TOTAL VALUE OF ALL FISH.	Number.		
	Boats.			Gill-nets.			Seines.			Trawls.		Canner- ies.	KINDS OF FISH.										
	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.		Salmon, fresh, lb.	Herring, salted, brls.	Lobsters, preserved in cans, lb.	Cod, dried, cwt.	Haddock, dried, cwt.	Hallbut, lb.	Smelts, lb.			Fish oil, galls.	Fish as bait, brls.
<i>Gaspé Co.</i>	\$			\$			\$			\$		Number.	Value.									\$ cts.	
1 Newport.....	150	4590	352	306	6520	4300	6	210	140	160	1350	2	400	3500	470	19080	3250	110	.....	6000	2000	650	24,565 00
2 Pabos.....	30	1920	108	87	1880	1716	2	80	60	22	330	2	150	24300	80	11808	634	.....	6000	578	260	12,068 40	
3 Grand River.....	151	8020	444	537	11390	4925	4	104	48	114	1860	2	400	5550	526	4200	6124	40	5800	1000	4000	1000	35,435 00
4 Cape Cove.....	82	3750	153	184	4980	2490	2	70	70	53	545	1	2000	195	21600	3010	52	.....	600	2000	650	21,553 50	
5 Percé and Bonaventure Island	85	3800	180	150	3000	1500	4	120	60	.....	.....	2	800	300	9840	2500	.....	.....	.....	1800	600	16,500 00	
6 Corner of Beach.....	16	640	40	41	1550	1150	4	120	80	4	60	1	300	16810	28	8392	860	.....	.....	300	200	8,546 00	
Totals.....	514	22720	1277	1299	29320	16081	22	704	458	353	4145	10	4050	50160	1599	75720	16138	202	5800	13600	10678	3300	118,797 90

GASPÉ BAY SUBDIVISION (Barachois to Fame Point).

1 Barachois.....	103	5050	201	60	1500	1200	10	500	400
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RETURN showing the Number and Value of Vessels, Boats, Nets, &c., also the Kinds of Fish caught in the County of Gaspé, Province of Quebec, &c.—Continued.

MONT LOUIS SUBDIVISION (Fame Point to Claude River).

Districts.	FISHING BOATS.			FISHING GEAR OR MATERIALS.						KINDS OF FISH.							TOTAL VALUE OF ALL FISH.	Number.
	Number.	Value.	Men.	Gill-nets.		Seines.		Salmon, fresh, lb.	Herring, salted, brls.	Cod, dried, cwt.	Cod, tongues and sounds, brls.	Halibut, lb.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.			
				Number.	Fathoms.	Value.	Number.									Fathoms.			Value.
<i>Gaspé Co.</i>		\$				\$										\$	cts.	
1 Grand Etang.....	9	200	18	30	900	400	1	30	30	5	15	.....	800	95	10	4,077 50	1
2 St. Yvon.....	25	1150	45	90	2700	1800	.....	.....	.....	50	2040	.....	2000	400	.....	10,605 00	2
3 Chloxydorme ..	33	1680	81	100	3000	2000	2	80	40	80	2520	3	2000	500	.....	13,590 00	3
4 Petite Anse and Frigate Point...	33	630	52	102	3000	1600	.....	.....	.....	70	1510	11000	1500	480	.....	9,830 00	4
5 Grand and Little Vallée.....	48	2100	95	170	4500	2700	1	30	20	200	2030	3	2700	870	.....	16,430 00	5
6 Magdalen.....	31	500	44	65	1950	850	.....	.....	.....	110	770	.....	700	240	.....	5,230 00	6
7 Manche d'Épée and Gros Mâle.....	52	550	74	115	3450	1600	.....	.....	.....	320	1270	.....	1100	480	.....	8,505 00	7
8 Anse Pleureuse and Mont Louis.....	94	2830	129	250	7500	5050	1	30	20	1300	2000	3	1800	700	350	18,265 00	8	
9 Rivière à Pierre and Claude.....	61	530	87	144	4200	2200	.....	.....	.....	720	870	3400	700	200	.....	9,205 00	9
Totals	389	10310	625	1092	31200	18200	5	170	100	14825	9	19600	13800	3965	340	95,737 50		

STE. ANNE DES MONTS SUBDIVISION (Claude River to Cape Chatte).

|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

SESSIONAL PAPER No. 22

RETURN showing the Number, Tonnage and Values of Vessels, Boats and Fishing Materials, &c.—Province of Quebec—Continued.

County of Gaspé—Continued.

MAGDALEN ISLANDS SUBDIVISION—SOUTH.

DISTRICTS.	FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.						LOBSTER PLANT.								
	Vessels.		Boats.		Gill-nets.		Seines.		Trap-nets.		Canneries.								
	Number.	Tonnage.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.							
<i>Gaspé Co.</i>			\$				\$			\$									
1 Entry Island.	7	150	3000	35	9	270	21	120	2000	625	8	1200	2840	1900	10	6300	1	75	1
2 Antierst Island.					141	5800	363	2518	4060	8930	6	800	1900	10	6300	4	6500	2	2
3 Grindstone Island.					263	17400	720	240	4450	1225	14	2060	4740	10	6300	11	4200	3	3
Totals.	7	150	3000	35	413	23470	1104	2878	50510	10780	14	2060	4740	10	6300	16	10775		

MAGDALEN ISLANDS SUBDIVISION—NORTH.

1 All Right Island.....					123	3690	327	736	14720	7360	8	5500	7	7000	1				
2 Grand Entry Island.....					62	1860	125	40	1200	400	9	6300	14	17500	2				
3 Grosse Isle Island.....					25	750	60	25	500	250	4	2800	10	3700	3				
4 Bryon Island.....					50	1500	125	25	500	50	2	2000	2	1000	4				
5 Wolf Island.....					4	120	11	5	150	50	1	1000	1	1000	5				
Totals.....					264	7920	648	806	16570	8060	21	14600	34	31200					

RETURN showing the Kinds and Quantities of Fish and Fish Products, in the County of Gaspé, Province of Quebec—Continued.

KINDS OF FISH AND FISH PRODUCTS.													Seal skins, No.	TOTAL VALUE OF ALL FISH.	Number.
Districts.	Herring, salted, brls.	Herring, fresh, lb.	Herring, smoked, lb.	Mackere], fresh, lb.	Mackere], salted, brls.	Lobsters preserved in cans, lb.	Cod, dried, cwt.	Cod, tongues and sounds brls.	Halibut, lb.	Eels, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.		
														\$	cts.
Gaspé Co.															
1 Entry Island.....	100	50000	.....	750	96	2736	27	.....	.....	.....	17	60	.....	2,880	60 1
2 Amherst Island.....	2000	50000	.....	15000	1243	172840	3204	10	450	45	1720	11200	500	105,734	00 2
3 Grindstone Island.....	2500	50000	.....	.....	2569	192420	3592	16	600	60	1160	20000	1000	146,222	00 3
Totals.....	4600	100000	.....	15750	3908	367996	6823	26	1050	105	2897	31260	1500	254,836	60
MAGDALEN ISLANDS SUBDIVISION—NORTH.															
1 All right Island.....	2390	.....	360000	.....	672	97650	910	.....	.....	.....	750	4870	1294	57,519	50 1
2 Grand Entry Island.....	2250	.....	.....	.....	120	230000	100	.....	.....	.....	75	5000	500	84,847	50 2
3 Grosse Isle Island.....	300	.....	.....	.....	100	75000	.....	.....	.....	.....	.....	1870	.....	24,405	00 3
4 Bryon Island.....	400	.....	.....	.....	250	55000	300	.....	.....	.....	12060	1900	4000	32,100	00 4
5 Wolf Island.....	43	.....	.....	.....	22	60000	120	.....	.....	.....	100	90	.....	16,228	50 5
Totals.....	5383	.....	360000	.....	1164	517650	1430	.....	.....	.....	12225	13730	1794	215,100	50

SESSIONAL PAPER No. 22

RETURN showing the Number, Tonnage and Value of Vessels and Boats, Nets, &c.—Province of Quebec—Continued.

County of Saguenay.

GODBOUT SUBDIVISION (Tadoussac to Jambons).

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.										LOBSTER PLANT.								
		Vessels.		Boats.		Gill-nets.			Seines.			Trap-nets.		Trawls.		Smelt-nets.		Hand Lines.		Canneries.		Traps.		
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
				\$								\$												
1	Tadoussac, Bergeronnes and Es-	2	25	750	5	27	540	31	54	1250														
2	coumins	1	15	450	2	16	230	32	18	900														
3	Mille Vaches and Port Neuf . . .	1	5	60	2	11	220	22	15	750														
4	Colombiers and Sault au Cochon, Bersimis	1	14	200	3	28	560	50	38	1940	3	250	190	1	35									
5	Pointe aux Outardes, Godbout and Pointe des Monts	1	15	250	3	117	2340	96	114	5700	5	200	200	2	70									
	Trinity Bay and Cariboo, Egg Island and English Point, Pen-tescost to Jambons	1	74	1710	15	199	3890	231	239	10540	8	450	390	3	105									
	Totals	6																						

MOISIE SUBDIVISION (Jambons to Pignon).

1	St. Margarets Bay	5	550	10	8	700	800	1	36	50								30	10
2	Caroussel Islands.	2	350	4	4	125	136	1	25	40								10	5
3	Seven Islands.	83	1400	5	24	2500	50	41	1300	1724	2	100	150				100	50	50
4	Moisie to Pignon	1	25	900	4	26	2000	53	47	5800	5440	3	75	112			120	60	60
	Totals	3	108	2300	9	57	6000	119	100	7925	8100	7	236	352			260	125	125

RETURN showing the Number, Tonnage and Value of Vessels and Boats, Nets, &c.—Province of Quebec—*Continued.*
County of Saguenay—*Concluded.*

MINGAN SUBDIVISION (Pigou to St. Charles).

DISTRICTS.				FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.										LOBSTER PLANT.								
Districts.				Vessels.		Boats.		Gill-nets.			Seines.		Trap-nets.		Trawls.		Smelt-nets.		Hand Lines.		Canneries.		Traps.			
				Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Saguenay Co.—Continued.						\$				\$			\$		\$		\$		\$		\$		\$			
1	River aux Grains and Chaloupe.			22	1320	46					4	150	200							276	193			1	2	
2	Sheldrake.			26	1300	46	10	500	500	4	150	200	1	400						276	193			2	3	
3	Thunder River.			55	4400	109	15	300	130	10	350	500								654	457			3	4	
4	Dock to Jupitagan.			14	1120	27					2	70	100							162	113			4	5	
5	Magpie.			27	2430	65	15	750	750	7	245	350								390	246			5	6	
6	St. Johns River.			42	3780	98	5	500	400	5	165	250								588	421			6	7	
7	Long Pt, Mingan and Romane.			23	2160	56	6	1000	1000	6	210	300								348	243			7	8	
8	Esquimaux Point, St. Charles.			72	10800	205	30	600	500	7	245	350	1	300						1230	615			8		
Totals				2	108	1800	17	281	3650	3300	45	1585	2250	2	700						3924	2481	3	450	300	250
NATASHQUAN SUBDIVISION (St. Charles to Natashquan Point).																										
1	Piashter Bay.			4	200	4	6	500	250											16	5			2	3	
2	Watsheeshoo and Pashasheeboo.			12	600	12	4	200	100											50	12			2	4	
3	Agwanus and Nabisippi.			60	3000	73	30	1500	750	2	80	75								150	40			2	5	
4	Mission Island.			14	700	20	8	400	200											60	25					
5	Natashquan.			1	30	900	6	90	5000	125	75	3000	2750	13	620	600				300	100					
Totals.				1	30	900	6	180	9500	234	122	5600	4050	15	700	675					576	182	4	550	1000	800

[illegible]

ST. AUGUSTIN SUBDIVISION (Coacoashoo to Chicatica).

[illegible]

BONNE ESPERANCE SUBDIVISION (Chicatica to Blancs Sablons).

[illegible]

ANTICOSTI ISLAND SUBDIVISION.

[illegible]

RETURN showing the Kinds and Quantities of Fish and Fish Products, &c.—Province of Quebec—Continued.
County of Saguenay.
GODBOUT SUBDIVISION—(Tadousac to Jambons).

KINDS OF FISH AND FISH PRODUCTS.																						
Number.	DISTRICTS.	Salmon, fresh, lb.	Salmon, salted, brls.	Herring, salted, brls.	Herring, fresh, lb.	Lobsters, preserved in cans, lb.	Cod, dried, cwt.	Cod, tongues and sounds, brls.	Halibut, lb.	Trout, lb.	Smelts, lb.	Reels, brls.	Sardines, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Whales, No.	White whale skins, No.	TOTAL VALUE OF ALL FISH.	Number.	
Saguenay Co.																						
1	Tadousac, Bergeronnes to Escoumains	35000	8	27						2400	1800		65	5302		40	154		121		10,053 60	1
2	Mille Vaches to Fort Neuf	29700		76										1074		155	78		21		6,803 20	2
3	Colombiers, Sault aux Cochons and Bersimis	57000	4											150			54		2		11,580 50	3
4	Pointe aux Outardes, Godbout to Pointe des Monts	28900	4	32			27		1350	2000	4100	6		1120	50	50	360		1		7,595 50	4
5	Trinity Bay to Cariboo, Egg Island and English Point, Pentecost to Jambons	87500	6	40		2304	937	3	13887	2100	3100			1153	73	40	72				24,911 60	5
	Totals	238100	22	175		2304	964	3	15237	6500	9000	6	65	8799	123	285	718		145		61,004 40	
MOISIE SUBDIVISION (Jambons to Pigou).																						
1	St. Margerets Bay	6012					239			453				390	32		38				2,535 70	1
2	Caronnel Islands						12							73	10		21				117 15	2
3	Seven Islands	20765		345	4000		338	16	3700					166000	50	30000	221	66			72,947 75	3
4	Moisie to Pigou	180790	17				465		4600	8740				500	100		36				40,184 50	4
	Totals	207507	17	345	4000		1054	16	8300	9193				166963	192	30000	316	66			115,785 10	

SESSIONAL PAPER No. 22

MINGAN SUBDIVISION (Pigou to St. Charles).

	1	2	3	4	5	6	7	8
1 River aux Grains and Chaloupe.....	600	980	880	250	.....	.....	.....	5,059 00
2 Sheldrake.....	4800	996	900	260	.....	.....	.....	5,262 00
3 Thunder River.....	2200	2332	2000	400	.....	.....	.....	13,027 50
4 Deck to Jupitagan.....	9300	859	800	200	.....	.....	.....	4,845 50
5 Magpie.....	6750	2068	2000	400	.....	.....	.....	12,366 00
6 St. Johns River.....	36750	2442	2200	500	.....	.....	.....	13,749 00
7 Long Point, Mingan and Roumaine.....	.....	4500	1200	300	.....	.....	.....	17,941 50
8 Esquimaux Point, St. Charles.....	.....	3394	3890	1000	.....	.....	275	18,746 75
Totals.....	60400	436	4800	5000	.....	.....	275	90,997 25

NATASHQUAN SUBDIVISION (St. Charles to Natashquan Point).

	1	2	3	4	5
1 Pishter Bay.....	2000	.....	60	10	.....
2 Watshechoo and Pashashchebo.....	2500	.....	15	15	.....
3 Agwauns and Nabissippi.....	15000	.....	1325	250	.....
4 Mission Island.....	1000	.....	180	30	.....
5 Natashquan.....	70000	80	3500	1000	.....
Totals.....	90500	80	5125	1305	.....

ROMAINE SUBDIVISION (Natashquan Point to Coacoashoo).

	1	2	3	4
1 Kegashka.....	25	162	1056	380
2 Watshechootai.....	8	20	700	36
3 Romaine.....	25	160	600	10
4 Coacoashoo.....	10	324	600	350
Totals.....	68	666	7056	950

ST. AUGUSTIN SUBDIVISION (Coacoashoc to Chicatica).

	1	2	3	4	5	6	7	8	9	10
1 Coacoashoo to Etamamu.....	50	.....	.....	1000	.....	.....	.....	.....	.....	.....
2 St. Marys.....	4	450	.....	.....	300	.....	.....	.....	.....	.....
3 Harrington.....	2	306	2000	.....	2500	750	.....	.....	.....	.....
4 Little Meccatina.....	10	.....	300	.....	700	300	.....	.....	.....	.....
5 Whale Head.....	10	.....	1500	.....	2000	300	.....	.....	.....	.....
6 Mutton Bay.....	10	25	2000	.....	2500	800	.....	.....	.....	.....
7 Meccatina to Tabatiere.....	30	120	1850	.....	7500	600	.....	.....	.....	.....
8 Great Meccatina.....	5	40	600	.....	1850	300	.....	.....	.....	.....
9 Fondrie à Fectan to St. Augustin.....	125	.....	750	6000	1400	200	.....	.....	.....	.....
10 Point à Giroux to Chicatica.....	20	.....	250	.....	400	100	.....	.....	.....	.....
Totals.....	256	491	1500	7000	19600	3550	.....	.....	.....	.....

RETURN showing the Kinds and Quantities of Fish and Fish Products, &c.—Province of Quebec—*Concluded.*
County of Saguenay—Concluded.

BONNE ESPERANCE SUBDIVISION (Chicatica to Blancs Sablons).

KINDS OF FISH AND FISH PRODUCTS.

DISTRICTS.	Salmon, salted brls.	Salmon.	Herring, salted, brls.	Herring, fresh, lb.	Lobsters, preserved in cans, lb.	Cod, dried, cwt.	Cod, tongues and sounds, brls.	Hallbut, lb.	Trout, lb.	Smelts, lb.	Eels, brls.	Sardines, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Whales, No.	Belugas, No.	TOTAL VALUE OF ALL FISH.	Number.
<i>Saguenay Co.—Concluded.</i>																				
1 Chicatica to Burnt Island.....	18					1340			600				1200	200		20			7,045 00	1
2 Bonne Esperance.....	60					5000							4000	1000					26,160 00	2
3 Pidgeon Island to Salmon Bay.....	50					3650			1400				3250	700					19,340 00	3
4 Little Fishery and Five League.....	10					60							500	100					3,450 00	4
5 Middle Bay and B lles Anouys.....	20					1660			200				1445	400					8,823 50	5
6 Bradore.....	25					5100			500				4950	750		75			26,190 75	6
7 Long Point.....	2					2000							2800	250		150			10,482 50	7
8 Green Island.....	5					5500							5000	700					27,523 50	8
Totals.....	190		33			24850			2700				23185	4100		245			128,505 25	

ANTICOSTI ISLAND SUBDIVISION.

1 Fox Bay.....					27936									2000						9,984 00	1
2 Baie Ste. Claire.....			25			400		2000						250						2,282 50	2
3 Strawberry Cove.....			40			450		2500						200						2,645 50	3
4 Shallop Creek.....	20																			300 00	4
5 Goose Point.....					40080										500					10,770 00	5
Totals.....	20		65		68016	850		4500						510	2645					25,992 00	

SESSIONAL PAPER No. 22

RECAPITULATION

Showing the Number, Tonnage and Value of Vessels and Boats and the Quantity and Value of all Fishing Materials in Gulf Division, Province of Quebec, for the Year 1905.

COUNTY OF BONAVENTURE.

FISHING VESSELS AND BOATS.										FISHING GEAR OF MATERIALS.											
Subdivisions.		Vessels.			Boats.			Gill-nets.		Seines.		Trap-nets.		Trawls.		Weirs.		Smelt-nets.		Hand Lines.	
Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	
1	Restigouche	5	290	7500	30	1283	22	40	70	4500	400	141	4390	4165	130	1600	33	2000	2808	1404	
2	Bonaventure	5	290	7500	30	1283	22	40	70	4500	400	141	4390	4165	130	1600	2	120	2808	1404	
3	Port Daniel	5	290	7500	30	1283	22	40	70	4500	400	141	4390	4165	130	1600	2	120	2808	1404	
	Total	5	290	7500	30	1283	22	40	70	4500	400	141	4390	4165	130	1600	37	2120	7408	2794	

COUNTY OF GASPÉ.

1	Grand River	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	22	704	458	353	4145	16	1030	3696	1848
2	Gaspé Bay	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	45	1885	1510	353	4145	16	1030	3696	1848
3	Mont Louis	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	5	170	100	353	4145	16	1030	3696	1848
4	St. Anne des Monts	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	11	2060	4740	10	6390	15	75	2356	630
5	Magdalen Islands, S.	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	14	2060	4740	10	6390	15	75	2356	630
6	" " N.	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	86	4819	6808	31	20900	368	4220	16	1030
	Total	7	150	3000	35	2392	98175	514	22720	1277	1299	29320	16981	86	4819	6808	31	20900	368	4220	16	1030

RECAPITULATION.

Showing the Number, Tonnage and Value of Vessels and Boats and the Quantity and Value of all Fishing Materials, &c.—*Concluded*.
COUNTY OF SAGUENAY.

FISHING VESSELS AND BOATS.										FISHING GEAR OR MATERIALS.																																		
Vessels.					Boats.					Gill-nets.					Seines.					Trap-nets.					Trawls.					Weirs.					Smelt-nets.					Hand Lines.				
Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.														
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RECAPITULATION
Showing the Quantity and Value of all Fishing Materials and Kinds of Fish in the Gulf Division, Province of Quebec, &c.—*Concluded.*
COUNTY OF SAGUENAY.

SUBDIVISIONS.	LOBSTER PLANT.				OTHER FIXTURES USED IN FISHERIES.								SALMON.		HERRING.		MACKEREL.		
	Canneries.		Traps.		Persons employed in canneries.	Freezers and Ice Houses.		Smoke and Fish Houses.		Piers and Wharfs.		Tugs, Steamers and Smacks.		Fresh, lb.	Salted, brls.	Fresh, lb.	Salted, brls.	Fresh, lb.	Salted, brls.
	Number.	Value.	Number.	Value.		Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.						
1	1	400	150	75	5	74	2220	21	635	1	175	1	238100	22	175	.....	.....	.....	.....
2	1	1000	15	56500	17	1	25000	207567	17	345	4000	.....	.....	.....	.....	.....	.....	.....	.....
3	3	450	300	250	12	3	800	46	12000	9	2200	.....	60400	436	.....	.....	.....	.....	.....
4	4	550	1000	800	16	.....	.....	30	4000	2	900	.....	90500	80	.....	.....	.....	.....	.....
5	5	1160	1900	950	25	.....	.....	73	3950	65	2100	.....	.....	68	666	.....	.....	.....	.....
6	4	300	450	450	9	.....	.....	35	3750	76	12150	.....	.....	256	491	.....	.....	.....	.....
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	190	33	.....	.....	.....	.....
8	2	20000	5000	2000	53	1	400	.....	.....	.....	.....	.....	.....	20	65	.....	.....	.....	.....
Total	19	22860	8890	4525	120	79	4420	220	80835	155	18275	1	596567	573	2291	4000	.....	.....	.....
GRAND TOTAL OF GULF DIVISION.																			
1	12	3620	11000	5635	260	54	8925	672	28640	2	30000	.....	215600	.....	9275	49000	80000	.....	1
2	6	46325	74845	57405	1021	26	4560	148	68000	33	19500	4	4800	166160	16517	100000	360000	15750	5072
3	19	22860	8890	4525	120	79	4420	220	80835	155	18275	1	596567	573	2291	4000	.....	.....	2
Grand totals	92	72805	94645	67565	1401	159	17905	1040	177475	190	67775	5	238900	978327	28083	153000	440000	15750	5072

SESSIONAL PAPER No. 22

RECAPITULATION

Showing the Kinds and Quantities of Fish and Fish Products in the Gulf Division, Province of Quebec, for the Year 1905.

COUNTY OF BONAVENTURE.

Number.	SUBDIVISIONS.	LOBSTERS.		COD.		HADDOCK.		Halibut, lb.	Trout, lb.	Smelts, lb.	Eels, brls.	Sardines, brls.	Tom-cod or frost fish, lb.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Whales, No.	White whales, No.	TOTAL VALUE OF ALL FISH.	Number.
		Preserved in cans, lb.	Fresh in shell, cwt.	Dried, cwt.	Tongues and Soups, brls.	Fresh, lb.	Dried, cwt.														
1	Restigouche	11550	183	11575	160	43000	245	2350	21600	77000	87	50000	50000	5787	3127	2600	.....	.....	.....	25,945 00	1
2	Bonaventure	60820	.....	18400	85	.....	2525	4500	6800	51200	87	29800	29800	11100	4840	43000	.....	.....	.....	135,701 85	2
3	Port Daniel	72370	183	30135	99	43000	2770	6850	28400	142200	87	111600	111600	16887	7967	59200	.....	.....	.....	152,594 00	3
	Total .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	314,240 85	

COUNTY OF GASPE.

Number.	SUBDIVISIONS.	LOBSTERS.		COD.		HADDOCK.		Halibut, lb.	Trout, lb.	Smelts, lb.	Eels, brls.	Sardines, brls.	Tom-cod or frost fish, lb.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Whales, No.	White whales, No.	TOTAL VALUE OF ALL FISH.	Number.
		Preserved in cans, lb.	Fresh in shell, cwt.	Dried, cwt.	Tongues and Soups, brls.	Fresh, lb.	Dried, cwt.														
1	Grand River	75720	.....	16138	.....	.....	202	5800	.....	13600	.....	.....	.....	10678	3300	.....	.....	.....	.....	118,797 90	1
2	Gaspe Bay	24000	.....	32274	.....	.....	.....	19600	.....	67150	.....	.....	.....	22176	4653	.....	.....	.....	.....	185,437 80	2
3	Mont Louis .....	.....	.....	14825	9	.....	.....	7375	.....	.....	.....	.....	.....	13800	3965	360	.....	.....	.....	95,737 50	3
4	Ste. Anne des Monts, S.	367996	.....	2506	.....	.....	.....	1050	.....	.....	105	.....	.....	1952	470	.....	.....	.....	.....	24,805 10	4
5	Magdalen Islands, S.	517650	.....	6823	26	.....	.....	.....	.....	.....	.....	.....	.....	2897	31260	1500	.....	.....	.....	254,836 60	5
6	" " N.	.....	.....	1430	.....	.....	.....	.....	.....	.....	.....	.....	.....	12925	13730	1794	4000	.....	.....	215,100 50	6
	Total	985366	.....	73996	35	.....	202	33825	.....	80750	105	.....	.....	64428	573-8	3654	4000	.....	.....	894,715 40	

RECAPITULATION

Showing the Kinds and Quantities of Fish and Fish Products in the Gulf Division, Province of Quebec, for the Year 1905—*Concluded*.
COUNTY OF SAGUENAY.

Number.	SUBDIVISIONS.	LOBSTERS.		COD.		HADDOCK.		Halibut, lb.	Trout, lb.	Smelts, lb.	Eels, brls.	Sardines, brls.	Tom-cod or frost fish, lb.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Whales, No.	White whale skins, No.	TOTAL VALUE OF ALL FISH.	Number.
		Preserved in cans, lb.	Fresh in shell, cwt.	Dried, cwt.	Tongues and sounds, brls.	Fresh, lb.	Dried, cwt.														
1	Godbout	2034	.....	964	3	.....	.....	15237	6500	9000	6	65	.....	8799	123	285	718	.....	145	61,004 40	1
2	Moisie .....	.....	.....	1054	16	.....	.....	8300	9193	.....	.....	.....	.....	166963	192	30000	316	66	.....	113,785 10	2
3	Mingan	4800	.....	14625	.....	.....	.....	5000	.....	.....	.....	.....	.....	13780	3310	.....	275	.....	.....	90,997 25	3
4	Natashquan	7000	.....	4770	.....	.....	.....	2500	6000	.....	.....	.....	.....	5125	1305	.....	615	.....	.....	46,788 75	4
5	Romaine	7056	.....	600	.....	.....	.....	1200	1900	10	10	.....	.....	950	195	.....	200	.....	.....	9,718 50	5
6	St. Augustin	1500	.....	8750	.....	.....	.....	7000	7000	.....	.....	.....	.....	19600	3550	.....	4050	.....	.....	62,767 00	6
7	Bonne Esperance .....	.....	.....	24850	.....	.....	.....	4500	2700	.....	.....	.....	.....	23185	4100	.....	245	.....	.....	128,505 25	7
8	Anticosti	68016	.....	850	.....	.....	.....	.....	.....	.....	.....	.....	.....	510	2645	.....	.....	.....	.....	25,992 00	8
	Total	90676	.....	56463	19	.....	.....	36737	33293	9000	16	65	.....	238912	15420	30285	6419	66	145	541,558 25	

1	Bonaventure County ..	72370	183	30135	99	43000	2770	275	6850	28400	142200	87	111600	16887	7967	59200	.....	.....	.....	314,240 85	1
2	Gaspé County	985366	.....	73096	35	.....	202	.....	33825	80750	105	105	.....	64498	57388	3654	4000	.....	.....	894,715 40	2
3	Saguenay County	90676	.....	56463	19	.....	.....	36737	33293	9000	16	65	.....	238912	15420	30285	6419	66	145	541,558 25	3
	Grand total	1148412	183	160594	153	43000	2972	275	77412	61693	231950	208	65	111600	320227	80775	93139	66	145	1,750,514 50	

SESSIONAL PAPER No. 22

RECAPITULATION.

STATEMENT showing Yield and Value of Fisheries in Gulf Division, Province of Quebec, for the Season of 1905.

Description.	Quantity.	Price.		Value.	
		\$	cts.	\$	cts.
Salmon, fresh in ice.....	Lb.	978,327	0 20	195,665	40
" salted	Brls.	573	15 00	8,595	00
Herring "	"	28,083	4 50	126,373	50
" fresh	Lb.	153,000	0 01	1,530	00
" smoked.....	"	440,000	0 02	8,800	00
Mackerel, fresh	"	15,750	0 12	1,890	00
" salted.....	Brls.	5,072	15 00	76,080	00
Lobsters, canned, fresh	Lb.	1,148,412	0 25	287,103	00
" whole "	Cwt.	183	5 00	915	00
Cod, salted.	"	160,594	4 50	722,673	00
" tongues and sounds.....	Brls.	153	10 00	1,530	00
Haddock, fresh	Lb.	43,000	0 03	1,290	00
" salted.....	Cwt.	2,972	3 00	8,916	00
Hake "	"	275	2 25	618	75
Halibut, fresh.....	Lb.	77,412	0 10	7,741	20
Trout "	"	61,633	0 10	6,169	30
Smelt "	"	231,950	0 05	11,597	50
Eels, salt	Brls.	208	10 00	2,080	00
Sardines, salted	"	65	3 00	195	00
Tom cod, frost fish, fresh.....	Lb.	111,600	0 03	3,348	00
Fish and whale oil.....	Galls.	320,227	0 30	96,068	10
Fish as bait	Brls.	80,775	1 50	121,162	50
Fish manure and guano.....	"	93,139	0 50	46,569	50
Seal skins.....	No.	10,419	1 25	13,023	75
White whale skins.....	"	145	4 00	580	00
Whales	"	66			
Total value, 1905.....				1,750,514	50
" 1904.....				1,557,959	10
Increase, 1905				192,555	40

RECAPITULATION

SHOWING Number of Men, Vessels and Boats, and Value of Material in Gulf Division Fisheries, for the Season of 1905.

Description.	Value.	
	\$	cts.
36 vessels of 1,434 tons, manned by 187 men	31,560	00
5,927 boats, fished by 11,309 men.....	212,150	00
294,844 fathoms gill-net.....	159,707	00
19,265 " seine	25,320	00
190 trap-nets for herring and cod	80,650	00
948 trawls	12,620	00
19 weirs	485	00
185 smelt and seal-nets	8,115	00
30,271 hand lines and sinkers.....	13,955	00
92 lobster canneries, employing 1,401 hands.....	72,805	00
94,645 lobster traps	67,565	00
159 freezers and ice houses.....	17,905	00
1,040 smoke and fish houses.....	177,475	00
190 private piers and wharfs.....	67,775	00
5 tugs, snacks and whaling steamers.....	29,800	00
Total value.	977,887	00

RETURN of the number of Fishermen, Value of Boats, Nets, &c., and the Kinds and
Levis, both inclusive, Province

Number.	DISTRICTS.	FISHING MATERIALS.								KINDS				
		Boats.			Gill-nets.			Brush or Eel Weirs		Salmon, lb.	Shad, lb.	Herring, salted, brls.	Herring, fresh, lb.	Herring, smoked, lb.
		Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Value.					
1	Capucins.....	16	160	26	13	300	160	1	25			48	1900	
2	Petits et Grands Méchins..	36	1280	90	78	1795	990			4400		670	9900	2000
3	Crosses Roches.....	17	180	37	21	480	220					135	1700	2400
4	Ste. Félicité.....	18	225	40	23	490	420	3	90			130	2600	2000
5	Matane.....	20	240	32	12	290	190	13	600	15000		420	4300	2900
6	Rivière Blanche.....	24	416	26	34	780	280	1	40	300		120	36200	3800
7	Sandy Bay.....	48	624	56	85	1960	1100	1	40			360	49600	3900
8	Métis.....	16	415	20	4	75	70	5	900	3400		72	22000	
9	Ste. Flavie and Ste. Luce..	27	490	40	35	460	350	9	630	5350		170	84600	
10	Rimouski.....	32	320	35				24	2750	2120		385	92000	
11	Bic.....	4	20	8				6	500	530		25	20000	
12	St. Fabien and St. Simon..	6	25	10				6	500	1880		30	45000	
13	Trois Pistoles.....			10				5	260	300	20	28	46000	
14	Ile Verte.....	40	375	57				27	2540	1960	5220	192	146400	50800
15	Cacouna.....	19	210	26				15	1750	4990	2940	186	300800	45900
16	Riv. du Loup & N.D. du Portage.....	4	65	13	3	800	600	13	600	450	150	12	208000	
17	St. André.....	6	42	18				11	1250		50	58	61200	1300
18	Kamouraska.....			9				4	680	120	1900	14	17200	
19	St. Denis.....			11				8	210	800	600		80000	
20	Rivière Ouelle.....	5	65	22				16	980	1200	530	10	60000	
21	Ste. Anne la Pocatière.....			9				8	300					
22	St. Roch & St. Jean Port Joli	20	260	24				22	2075					
23	L'Islet and Cap St. Ignace..	11	60	15				14	1500					
24	Crane and Goose Islands...			7				7	1030					
25	Montmagny.....	2	20	2	1	40	50	2	500	30	350			
26	Berthier.....	18	145	22	8	280	235	13	2900	150	375			
27	St. Valier.....	7	110	5				6	3700	445	3100			
28	St. Michel.....	10	75	11				8	2900	160	2000			
29	Beaumont.....	19	225	14				12	7200	300	9850			
30	St. Joseph and Levis.....	15	135	8				8	7270	260	2665			
31	St. Romuald & New Liv'pl.	3	60	2				2	500	25	50			
32	St. Nicholas.....	12	160	8				8	3000	220	5350			
	Totals.....	455	6402	707	317	7750	4665	278	47220	44120	35150	3065	1289400	115500
	Values..... \$									8824	2109	13792	12894	2310

SESSIONAL PAPER No. 22

Continued.

Value of all Fish in the South Shore District extending from County **Rimouski** to of Quebec, for the Year 1905.

OF FISH AND FISH PRODUCTS.

Trout, lb.	Sea bass, lb.	Pickarel, lb.	Cod, salted, lb.	Halibut, lb.	Sturgeon, lb.	Eels, lb.	Whitefish, lb.	Sardines, brls.	Clams, brls.	Mixed and coarse fish, lb.	Oil, galls.	Fish as bait, brls.	Fish as fertilizer, brls.	VALUE.	Number.
														% cts.	
100			32200	175				30	85		105	12	10	1,865 00	1
350			151300	1700					40		485	100	130	10,731 50	2
			69200	2700							260	53	48	3,892 00	3
			66200	2000				40			195	50		3,752 50	4
300			24900	3000				650		5000	120	25	80	8,430 50	5
			36000	2000				30			190	20	5	2,857 50	6
			18100	3000				40			85	20	70	3,428 50	7
			2800	6000				520			50		160	3,591 00	8
100			400	6900				1100					5200	9,297 00	9
11000				2200				495					4900	8,331 50	10
								100					250	843 50	11
								20						1,021 00	12
					40			150		4500			80	1,184 60	13
				290	100			1340		10000			3840	10,214 35	14
				410	1100			605		40800			2016	9,295 00	15
3000					150	1010		100		1200	70		64	2,967 60	16
					6150	1680		375		40000	10		370	4,174 80	17
					2750			700			35		700	2,998 50	18
					300	6850		200			25		1200	2,632 50	19
					1300	29150		130			60		550	3,426 80	20
					100	4780				600				298 80	21
						6150				4600				415 00	22
1000	100			4000		4400				10450				718 50	23
	200	200				10000				1000				640 00	24
1000				3000		1400				4000				431 00	25
	175				31700	16700	1200			3500				3,129 00	26
	2800	550			6800	14600	5700			1800				2,454 50	27
	1375	800			1325	33400	940			2150				2,528 50	28
	1250	1100			1250	70940	1400			1250				5,314 90	29
1000	645	360			1130	57000	750			7150				4,028 70	30
	65	175				4000	75			2200				292 75	31
	750	2100			5800	11350	1675			7500				1,816 50	32
17850	7360	5285	401100	29675	66495	274610	11740	6985	125	147700	2120	280	19673		
1785	736	264	16044	2967	398970	16476	1174	20955	250	1477	636	420	9836	116,903 80	

*Between Nos. 14 and 20, add 11 belugas and 15 seal skins valued at \$62.75.

SESSIONAL PAPER No. 22

all Kinds of Fish caught in the inland District from Quebec to Pontiac, in the
for the Year 1905.

KINDS OF FISH.													VALUE.	Number.
Shad, lb.	Whitefish, lb.	Trout, lb.	Bass, lb.	Pickarel, lb.	Pike, lb.	Maskinonge, lb.	Sturgeon, lb.	Eels, lb.	Perch, lb.	Bullheads, lb.	Catfish, lb.	Mixed and coarse fish, lb.		
													\$ cts.	
.....	8900	55300	12400	23700	57600	2400	27000	9100	8700	8100	7500	135600	20,449 00	1
.....	.....	2000	3500	5000	5000	1100	2200	9200	10200	7300	5900	7100	3,359 00	2
1000	.....	.....	400	600	500	150	400	1500	1000	800	900	1200	467 00	3
3000	.....	16000	1500	2000	2500	300	1000	3000	2000	2000	500	10000	3,040 00	4
200	300	15400	500	1700	3800	450	1100	1800	5500	6000	1500	19900	3,428 00	5
.....	.....	500	500	1100	2400	150	900	6100	4200	3000	2600	16000	1,683 00	6
3400	2000	3200	1300	1800	4900	350	2100	3700	3200	2800	2500	10500	*5,372 00	7
8000	1000	.....	1200	3200	6100	400	2000	18300	4400	2300	2600	66400	4,988 00	8
.....	400	.....	700	4300	12200	420	1500	12100	1200	5300	800	64400	4,289 00	9
1200	300	.....	500	2000	3000	200	900	9000	3000	1100	1000	10000	1,651 00	10
.....	.....	.....	6100	4500	36100	.....	500	84300	52000	24300	.....	191600	17,516 00	11
.....	250	.....	300	800	1500	150	800	2500	1200	600	300	20000	1,122 00	12
1100	700	.....	500	1000	1460	100	700	2100	900	500	1200	49700	2,134 00	13
900	.....	.....	1000	500	500	150	300	600	1100	700	500	5300	562 00	14
.....	.....	.....	3100	1600	900	450	2700	6500	12800	4600	2300	20500	2,666 00	15
.....	.....	.....	2000	1500	1200	400	6000	45000	1000	1000	1500	1200	3,691 00	16
.....	3200	.....	.....	36800	3500	.....	.....	.....	40200	.....	.....	27700	7,016 00	17
.....	15600	26500	10700	15600	1300	100	.....	500	12600	.....	.....	17800	8,109 00	18
18800	32650	118900	46200	107700	144460	7270	50100	215300	165200	70400	31600	674900	.....	.....
1128	3265	11890	4620	10770	7223	727	3006	12918	8260	3520	948	20247	91,542 00	.....

* In No. 7 add 100,000 lbs. tom-cod, \$3,000 ; also 100 lbs. salmon (angling), \$20.

STATEMENT.

NORTH SHORE of the St. Lawrence from **Quebec to the Saguenay**, including Lake St. John district, 1905.

Fishing Materials and Kinds of Fish.	Counties of Quebec and Montmorency, including Isle of Orleans.	Charlevoix and Isle aux Coudres.	Lake St. John and Tributaries.	Total Quantity.	Total Value.
<i>Materials.</i>					\$ cts.
Boats No.	15	17	16	48	336 00
Weirs "	125	48	.....	173	12,500 00
Gill-nets..... Fathoms.	400	360	2,100	2,860	572 00
Lines No.	50	40	30	120	92 00
Total value.....	.....	.....	.....	.....	13,500 00
<i>Kinds of Fish.</i>					
Salmon..... Lbs.	1,200	3,700	45,000	49,900	7,485 00
Herring..... "	.....	4,100	.....	4,100	41 00
Whitefish..... "	2,100	.....	15,000	17,100	1,710 00
Trout..... "	8,000	15,400	17,000	40,000	4,040 00
Onananiche..... "	.....	.....	11,000	11,000	1,100 00
Pickarel..... "	900	.....	55,000	55,900	5,590 00
Pike..... "	.....	.....	14,500	14,500	725 00
Eels..... "	269,600	58,300	.....	327,900	19,674 00
Perch..... "	300	.....	1,400	1,700	85 00
Mixed fish..... "	28,700	155,700	68,200	252,600	2,526 00
Sardines..... Brls.	80	130	.....	210	630 00
Beluga skins..... No.	.....	.....	45	45	180 00
Fish oil..... Galls.	.....	.....	2,900	2,900	870 00
Totals ..	326,800	263,200	227,100	817,100	.....
Values \$	17,998	7,581	19,077	.....	44,656 00

SESSIONAL PAPER No. 22

RECAPITULATION

SHOWING the Yield and Value of the Fisheries of the Province of Quebec,
(exclusive of the Gulf division), for the Year 1905.

Kinds of Fish.	Quantity.	Price.		Value.	
		\$	cts.	\$	cts.
Cod (green)..... Lb.	401,100	0	04	16,044	00
Halibut..... "	29,675	0	10	2,967	50
Salmon..... "	94,120			16,329	00
Ouananiche..... "	11,000	0	10	1,100	00
Trout..... "	177,150	0	10	17,715	00
Whitefish..... "	61,490	0	10	6,149	00
Herring, salted..... Brls.	3,065	4	50	13,792	50
" fresh..... Lb.	1,293,500	0	01	12,935	00
" smoked..... "	115,500	0	02	2,310	00
Sardines..... Brls.	7,195	3	00	21,585	00
Shad..... Lb.	53,950	0	06	3,237	00
Eels..... "	817,810	0	06	49,068	60
Maskinongé..... "	7,270	0	10	727	00
Bass (sea)..... "	7,360	0	10	736	00
" (Achigan)..... "	46,200	0	10	4,620	00
Pickarel (Doré)..... "	168,885			16,624	25
Pike..... "	158,960	0	05	7,948	00
Perch..... "	166,900	0	05	8,345	00
Sturgeon..... "	116,595	0	06	6,995	70
Tom-cod..... "	100,000	0	03	3,000	00
Bullheads, dressed..... "	70,400	0	05	3,520	00
Catfish..... "	31,600	0	03	948	00
Coarse fish..... "	1,075,200			24,250	00
Clams..... Brls.	125	2	00	250	00
Fish as bait..... "	280	1	50	420	00
" as fertilizer..... "	19,673	0	50	9,836	50
" oil..... Galls.	5,020	0	30	1,506	00
Hair seal skins..... No.	15	1	25	18	75
Belugas (white whales) skins..... "	56	4	00	224	00
Total for 1903.....				253,201	80
" for 1904.....				193,437	80
Increase.....				59,774	00

STATEMENT showing the Fishing Materials in the above districts (exclusive of the Gulf Division), 1905.

Articles.	Value.	
	\$	cts.
1,424 fishing boats (1,877 men).....	14,873	00
14,610 fathoms gill-nets.....	6,032	00
4,055 " seines.....	2,885	00
451 weirs (brush or wire).....	59,720	00
2 " (special eel).....	60,000	00
3,011 hoop-nets.....	12,970	00
fishing lines, night lines, &c.....	1,545	00
72 fish houses or ice houses.....	2,968	00
Total.....	160,988	00

6-7 EDWARD VII., A. 1907

RECAPITULATION

Of the Fisheries product of the whole Province of **Quebec** for the year 1905.

Kinds of Fish.	Quantity.	Rate.		Value.		Total Value.	
		\$	cts.	\$	cts.	\$	cts.
Salmon, fresh..... Lb.	1,072,447	.....	.....	211,994	40		
" salted..... Brls.	573	15	00	8,595	00		
						220,589	40
Ouananiche..... Lb.	11,000	0	10			1,100	00
Trout..... "	238,843	0	10			23,884	30
Whitefish..... "	61,490	0	10			6,149	00
Smelts..... "	231,950	0	05			11,597	50
Cod, dried..... Cwt.	160,594	4	50	722,673	00		
" green..... Lb.	401,100	0	04	16,044	00		
" tongues and sounds.. Brls.	153	10	00	1,530	00		
						740,247	00
Haddock, dried..... Cwt.	2,972	3	00	8,916	00		
" fresh..... Lb.	43,000	0	03	1,290	00		
						10,206	00
Hake... Cwt.	275	2	25			618	75
Halibut..... Lb.	107,087	0	10			10,708	70
Tom-cod..... "	211,600	0	03			6,348	00
Herring, fresh..... "	1,446,500	0	01	14,465	00		
" smoked..... "	555,500	0	02	11,110	00		
" salted..... Brls.	31,148	4	50	140,166	00		
						165,741	00
Sardines..... "	7,260	3	00			21,780	00
Shad..... Lb.	53,950	0	06			3,237	00
Mackerel, fresh..... "	15,750	0	12	1,890	00		
" salted..... Brls.	5,072	15	00	76,080	00		
						77,970	00
Bass, (sea)..... Lb.	7,360	0	10			736	00
" (Achigan)..... "	46,200	0	10			4,620	00
Pickarel..... "	168,885					16,624	25
Perch..... "	166,900	0	05			8,345	00
Pike..... "	158,960	0	05			7,948	00
Maskinonge..... "	7,270	0	10			727	00
Eels..... "	817,810	0	06	49,068	60		
"..... Brls.	208	10	00	2,080	00		
						51,148	60
Sturgeon..... Lb.	116,595	0	06			6,995	70
Lobsters, preserved in cans. "	1,148,412	0	25	287,103	00		
" fresh in shell..... "	183	5	00	915	00		
						288,018	00
Clams..... Brls.	125	2	00			250	00
Bullheads, dressed..... Lb.	70,400	0	05			3,520	00
Catfish..... "	31,600	0	03			948	00
Coarse and mixed fish..... "	1,075,200					24,250	00
Fish as bait..... Brls.	81,055	1	50			121,582	50
" as fertilizer..... "	112,812	0	50			56,406	00
" oil..... Galls.	325,247		30			97,574	10
Seal skins..... No.	10,434	1	25			13,042	50
Belugas, or white whale skins..... "	201	4	00			804	00
Total for 1905.....						2,003,716	30
" 1904.....						1,751,396	90
Increase.....						252,319	40

SESSIONAL PAPER No. 22

RECAPITULATION.

Of the Capital invested in Vessels, Boats, Nets, &c., in the Fisheries of the whole Province of Quebec for 1905.

Articles.	Value.	Total.
	\$	\$ cts.
36 fishing vessels (1,434 tons)	31,560	
7,351 " boats	227,023	258,583 00
309,454 fathoms of gill-nets	165,739	
23,320 " seines	28,205	
190 trap-nets	80,650	
470 weirs	60,205	
2 special eel weirs	60,000	
3,011 hoop-nets	12,970	
185 smelt-nets	8,115	
948 trawls	12,620	
30,271 hand lines	13,955	
..... fishing lines, night lines, &c.	1,545	444,004 00
92 lobster canneries.	72,805	
94,645 " traps	67,565	140,370 00
159 freezers and ice houses	17,905	
1,112 fish and smoke houses	180,438	
190 private fishing piers or wharfs	67,775	
5 fishing tugs or smacks	29,800	295,918 00
Total		1,138,875 00

STATEMENT of Persons engaged in the Quebec Fisheries, 1905.

Number of men in fishing vessels	187
" " " boats	13,186
" persons in lobster canneries.	1,401
Total	14,774

APPENDIX No. 8.

PRINCE EDWARD ISLAND.

REPORT ON THE FISHERIES OF PRINCE EDWARD ISLAND FOR THE
YEAR 1905, BY INSPECTOR J. A. MATHESON.

CHARLOTTETOWN, January 2, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour so submit my annual report on the Fisheries of the province of Prince Edward Island, together with tabulated statistics, showing the catch in detail in each county and locality.

I regret to report a decrease in the value of the total catch of \$79,624 as shown below :

Total value for 1904.....	\$1,078,546
Total value for 1905	998,921
Decrease	\$ 79,624

LOBSTERS.

The catch of lobsters shows a shortage of about eleven per cent of last season, but fishermen received remunerative prices and made up for the shortage of catch. Considering the large number of factories in operation and traps used in this fishing the average for the last five years has been fairly maintained, as follows :

Year.	No. of Cans.
1901	2,223,712
1902	2,386,070
1903	2,039,603
1904	2,335,400
1905	2,182,624

OYSTERS.

This branch of our fisheries continued to be one of the most important industries and is prosecuted with a good deal of energy in our bays and rivers. The total catch is very little short of last year. The prices obtained by our fishermen were good, and as soon as the federal and provincial governments arrive at a settlement as to which shall lease the areas for cultivating purposes, I have every reason to believe that the oyster industry will be one of our largest and most profitable ones.

SESSIONAL PAPER No. 22

The following shows the quantity in barrels for last 10 years :

1896.....	30,214
1897 ..	20,915
1898.....	26,484
1899.....	18,236
1900.....	17,825
1901.....	24,972
1902.....	20,334
1903.....	18,333
1904.....	18,006
1905.....	17,356

COD.

The season's catch has been a little in excess of last year, but this branch of our fisheries is not followed by any great numbers of our fishermen, as the uncertainty of good catches is so great that fishermen will not devote their time to it. Dogfish still visit our coast and are very destructive to fishing gear and tend much to shorten the catch. The cod drier erected in Souris has been a boon to the fishermen, especially late in the season, when the weather is unfavourable for outside drying.

HAKE.

You will notice a considerable increase in the catch of this fish, which was sold by fishermen at good paying prices.

MACKEREL.

The catch of mackerel this season was small, but the quality was good, and quantity was only a little short of last year, late in the season large shoals of small mackerel were taken off Rustico, which were disposed of at good prices.

HERRING.

I have to report a considerable shortage in the catch of herring, which are principally used for the purposes of bait.

The fall fish, which were of good quality, were much short of last season's catch.

The smokehouse in Georgetown was not operated this season.

SMELTS.

The catch of smelts this season is the largest for the past five seasons, a great many fishermen engage in this business and make it profitable during the winter months.

TROUT.

More trout have been taken than in former years. The catch is yearly increasing, although not shipped, is used for local consumption, and sportsmen are much interested. With the aid of the hatchery established at South Port last season to replenish our streams and rivers, a considerable increase of this fish in the near future is anticipated.

QUAHAUGS.

Large quantities, some thousands of barrels were taken and shipped, realizing good prices in the American market. I would advise some restrictions being put on this fishing, as under present regulations it is difficult to prevent fishermen from interfering with oyster beds when fishing them ; the season might be made uniform with the oyster season.

6-7 EDWARD VII., A. 1907

Overseer Davison, Prince County, reports there is a decrease in almost all branches of the fishing except herring. It is the opinion of many of our fishermen that the decrease in oysters is largely owing to the destruction of the small oysters by the starfish, which has become very plentiful in our waters. He says:

I am of opinion that the decrease in mackerel and codfish is principally caused by the dogfish who destroy the gear and rob the bait from the hooks. The only reason I can give for the decrease in lobsters is that they are overfished. I would strongly recommend that some regulations be made regarding gill-net fishing for smelts, as they are becoming very generally in use.

The fishing of quahaugs is getting to be quite an industry, and their value is double that of previous years. They are mostly shipped to the United States. About 70 per cent of the lobsters are shipped to England, 25 per cent to the United States, 5 per cent to Canada. Cod are mostly all shipped to Halifax. Excepting about 10 per cent for home consumption, 90 per cent of the catch of smelts goes to the United States, 10 per cent to Canada. Mackerel all go to the United States.

Overseer McCormack, King's County, reports the lobster season opened later than usual on account of the scarcity of bait. First lobsters packed May 1st, with good fishing during May. About the 10th of June a shoal of small cod struck inshore and drove the lobster into deep water for about two weeks, from that till the close of the season they had about the usual fishing. On the whole there was a fair pack in this county, although near 2,000 cases short of 1904, which was a banner year.

Cod struck in about the 25th May and good catches of large fish were taken, for about two weeks, when they slacked off and were very scarce during the rest of the season, until November, when there was good fishing until the end of December, which brought the yield up to 1,000 quintals above last year.

Hake fishing was about the same as last season, but no doubt would have been much better had it not been for the dogfish which destroyed the trawls as fast as they were put out.

I am, sir,

Your obedient servant,

J. A. MATHESON,

Inspector of Fisheries

SESSIONAL PAPER No. 22

RETURN showing the Number, Tonnage and Value of Vessels and Boats, and the Quantity and Value of all Fish in the County of King's, Province of Prince Edward Island, for the Year 1905.

DISTRICTS.	FISHING VESSELS AND BOATS.					FISHING GEAR OR MATERIALS.					LOBSTER PLANT.		KINDS OF FISH.					Number.	
	Vessels.			Boats.		Gill-nets.		Trawls.		Hand Lines.	Can-neries.	Salmon, fresh, lb.	Herring, salted, brls.	Herring, fresh, lb.	Mackereel, fresh, lb.	Mackereel, salted, brls.	Lobsters, preserved in cans, lb.		
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Fathoms.	Value.	Number.	Value.									Number.
<i>King's Co.</i>																			
1 Souris and Red Point	2	36 1400	8	84	300	5000	3000	25	250	100	4	2000	400	20000	500	75	56928	1	
2 Bay Fortune				300	44	60	1200	600	4	40	50	3	2000	150	10000	500	50784	2	
3 Annandale				75	300	6000	2400	12	120	100	5	4100	150	20000	500	10	123792	3	
4 Georgetown	3	82 2000	15	130	500	9000	5000	20	200	200	5	5000	100	200000	600	10	116592	4	
5 Murray Harbour, North				65	2000	75	300	6000	3000	5	50	100	12	4900	50	40000	164928	5	
6 " " South	9	186 4500	46	91	200	4000	2000	50	500	200	5	3400	400	100000	...	...	66288	6
7 Morell and St. Peters	1	15 600	5	90	150	3000	1300	10	150	100	8	8000	100	12000	1000	225	142176	7	
8 Naufrange				40	800	100	2000	1000	4	40	150	5	4600	50	10000	500	6	75360	8
9 North Lake				50	750	50	100	2000	6	60	4	3000	150	100000	1000	36	96864	9	
10 East Lake				64	600	70	120	2400	1200	30	300	140	1	1000	50	30000	15	37536	10
Totals	15	319	74	809	2130	40600	...	166	...	1200	52	...	19000	1600	452000	4600	367	931248	
Values		8500		12250			20700	...	1710	38000	7200	4520	552	5505	232812		

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of King's, Province of Prince Edward Island, for the Year 1905.

Number.	DISTRICTS.	KINDS OF FISH.																	TOTAL VALUE OF ALL FISH.	Number.	
		Cod, dried, cwt.	Cod Tongues and Sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Hake Sounds, lb.	Trout, lb.	Smelts, lb.	Alwives or Gaspareau, brls.	Eels, brls.	Capelin, brls.	Clams, brls.	Clams, cases.	Tom-cod or Frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.			Fish as bait, brls.
<i>King's Co.</i>																					
1	Souris and Red Point	1900	5	1000	70	2000	4000	1500	2000	2000	50	150	15	1000	50	75	400	1500	36,842 00	1	
2	Bay Fortune	200				40	80	2000	20000		10		5	1000		10	150	400	16,616 00	2	
3	Annandale	240	4	1000		20	40	400	10000		20		10	1500	5	25	100	1000	35,523 00	3	
4	Georgetown	560	10	1500		75	150	1000	30000	40	60		15	80	10	30	200	1400	39,950 75	4	
5	Murray Harbour, North	300				80	160	500	20000		10		10	200			200	2000	48,717 00	5	
6	" " South	975	10	800		1500	3000	1000	10000		5	50	20	180		40	1500	1000	32,418 50	6	
7	Morell and St. Peters	700	5	1000	40	300	600	2000	25000	75	40				20	15	750	1400	52,294 00	7	
8	Nauforange	250						500	2000		4						100	1250	22,535 00	8	
9	North Lake	350						1500	10000	20							300	600	29,006 00	9	
10	East Lake	320	4			200	400	500	5000		40	20				10	250	400	13,809 00	10	
Totals		5795	38	5300	110	4215	8430	10000	134000	135	239	220	75	460	4900	110	195	3950	10950	
Values		26077	380	159	330	9484	4215	1090	6700	540	2390	770	300	2300	147	440	390	1185	16425	327,711 25	

SESSIONAL PAPER No. 22

RETURN showing the Number of Vessels, Boats, Nets, &c., and the Quantity and Value of all Fish in the County of Queen's, Province of Prince Edward Island, for the Year 1905.

DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						KINDS OF FISH.						Number.					
	Vessels.			Boats.			Gill-nets.			Seines.			Trawls.			Value.	Lobster canneries, No.	Herring, salted, brls.		Herring fresh, lb.	Herring, smoked, lb.	Mackerel fresh, lb.	Mackerel salted, brls.	Lobster, preserved in cans, lb.
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.									
Queen's Co.																								
1 Tracadie.....	4	72	2000	16	150	4500	228	300	3000	3000	3	400	1000	45	450	5000	1200	4000	25000	450	122448	1		
2 New London ..	1	10	300	5	90	1800	155	225	4500	2250	4	600	600	20	175	2900	400	2500	20000	450	61776	2		
3 Point Prim.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	3		
4 Rustico.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	4		
5 Wheatley river.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	5		
6 Pownall.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	6		
7 Charlottetown ..	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	7		
8 Crapaud.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	8		
9 Lot 65.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	9		
10 Bays and rivers.....	1	10	300	5	115	2500	280	100	3000	700	4	1000	200	60	240	4185	130	20000	20000	500	101760	10		
Totals	5	82	21	637	1187	706	11525	11	2000	1800	865	55	28890	26235	21000	127188	5830	226500	1500	65000	1400	508752		
Values.....	5	82	21	637	1187	706	11525	11	2000	1800	865	55	28890	26235	21000	127188	5830	226500	1500	65000	1400	508752		

6-7 EDWARD VII., A. 1907

Return showing the Kinds and Quantities of Fish and Fish Products in the County of Queen's, Province of Prince Edward Island, for the Year 1905.

Number.	DISTRICTS.	KINDS OF FISH.													TOTAL VALUE OF ALL FISH.	Number.						
		Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Trout, lb.	Smelts, lb.	Alwives or Gaspereau, brls.	Eels, brls.	Oysters, brls.	Clams, brls.	Flounders, lb.			Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Quahaugs, brls.	
<i>Queen's Co.</i>																						
1	Tracadie.....	100	1450	35	8500	45	...	1000	100000	200	150	2560	100	2000	50	1200	1500	20	500	78,157 00	1	
2	New London.....	...	550	10	1500	100	50	1000	20000	50	50	100	...	...	10	300	1000	90	...	33,481 50	2
3	Point Prim.....	...	70	...	...	...	...	600	15000	...	90	500	10	...	...	...	900	400	1000	34,340 00	3
4	Rustico.....	75	3500	140	...	100	...	1500	35000	250	250	...	25	...	50	175	650	210	...	79,176 50	4	
5	Wheatley river.....	...	1000	10	...	...	...	1000	12000	...	...	...	...	...	...	...	...	...	...	5,300 00	5
6	Pownall.....	...	...	...	...	...	...	...	6000	...	...	200	...	...	...	...	500	400	500	9,414 00	6
7	Charlottetown.....	100	...	...	...	...	...	...	35000	...	25	...	10	...	...	...	600	300	...	13,706 00	7
8	Crapaud.....	...	...	...	...	...	...	...	25000	...	...	1100	...	...	...	...	800	400	3000	35,423 00	8
9	Lot 65.....	25	1200	...	...	...	...	5000	58000	300	150	100	...	...	...	...	900	450	1000	8,400 00	9
10	Bays and rivers.....	50000	300	10
Totals.....		300	7770	195	10000	245	50	10100	336000	550	715	4560	145	2000	110	1675	6850	2270	6000
Values.....		2100	34965	1950	300	735	112	1010	18300	2200	7150	22800	580	60	220	502	10275	2270	12000	802,048 00

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., in the County of Prince, Province of Prince Edward Island, for the Year 1905.

SESSIONAL PAPER No. 22

DISTRICTS.	FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.				LOBSTER PLANT.		KINDS OF FISH.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	Vessels.		Boats.		Gill-nets.		Trawls.		Canneries.		Herring, fresh, lb.	Mackereel, fresh, lb.	Mackereel, salted, brls.	Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Fathoms.	Value.	Number.	Value.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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RETURN showing the Kinds and Value of Fish &c., in the County of Prince, Province of Prince Edward Island, for the Year 1905—Continued.

Number.	DISTRICTS.	KINDS OF FISH.										FISH PRODUCTS.				TOTAL VALUE OF ALL FISH.	Number.				
		Cod, dried, cwt.	Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Hake Sounds, lb.	Trout, lb.	Smelts, lb.	Alwives or Gaspe- reau, lb.	Eels, brls.	Oysters, brls.	Clams, brls.	Tom-cod or frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.			Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	
1	Tignish..	1800		80	1050	3000		2250								2000	5000	200	55,015	00	1
2	Alberton..	922			500	1000		36000								950	587		24,307	00	2
3	Lot 11.....	49						19800									600		8,745	50	3
4	Narrows.....	150	5000		20			40000			900	500					1000		16,845	00	4
5	Grand River..	20						16000			2000						525		22,363	50	5
6	Richmond Bay.	15			10			3675			2500						200		14,288	75	6
7	Sun-merside..							35000			400						100		4,430	00	7
8	Travellers Rest	15						10000		15	2000	200					80	300	11,637	50	8
9	Carleton.....							10000			200						400		7,596	00	9
10	Tryon.....							4095									1270		20,817	75	10
11	Malpeque.....	201			223	500		26000		25	2600	25					350		24,037	75	11
12	Egmont Bay																4580		51,923	00	12
13	West Point									10							1240		7,154	50	13
14	Mimingash.....	480			424	1550		8000							39		540		18,204	00	14
15	Nail Pond.....	511			230	1050											590	1382	21,005	50	15
16	Skinner's Pond.	500			285	570		14000		5	100	1200					190	900	24,993	25	16
17	Brae.....							9000			1000	100					50		8,430	00	17
18	Bideford.....							48300		13	396								6,325	00	18
19	Rivers Lot 5 & 6.	91						2000		50	1000	10							8,840	50	19
20	Wellington..	20																	12,208	00	20
	Totals	4799	5000	341	2742	7670	400	283620	50	118	13096	2035	100	5	39		4270	20164	700		
	Values	21595	150	1023	6169	3835	40	14181	200	1180	65480	4070	3	20	78		1281	30246	700	369,162	50

SESSIONAL PAPER No. 22

RECAPITULATION by Counties showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., in the Province of Prince Edward Island for the Year 1905.

FISHING VESSELS AND BOATS.										FISHING GEAR OR MATERIALS.																																		
Districts.					Vessels.					Boats.					Gill Nets.					Seine.					Trap-nets.					Trawls.					Smelt-nets.					Hand Lines.				
					Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Value.	Fathoms.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.													
County.																																												
1 King's.....					15	319	8500	74	572	12250	809	2130	40600	20700	11	2000	1800	60	3000	125	865	710	97	1280	1290	1290	2970	1	2	3														
2 Queen's.....					5	82	2300	21	37	1305	1187	706	11525	6475	6	300	1000	1	1000	70	1317	119	184	3805	908	344	2	2	2															
3 Prince.....					3	89	2250	18	731	32901	1328	2502	39475	6973	2	300	1000	1	1000	70	1317	119	184	3805	908	344	2	2	2															
Totals.....					23	490	13050	113	1940	46056	3324	5338	91600	34148	13	2300	2800	63	4450	361	2892	400	7663	2299	2299	2747	4	4	4															

LOBSTER PLANT.										OTHER FIXTURES USED IN FISHERIES.										WHOLE FISHING GEAR.											
Districts.					Canneries.		Traps.		Persons employed in Canneries.		Freezers and Ice Houses.		Smoke and Fish Houses.		Piers and Wharfs.		Tugs, Steamers and Smacks.		Value.		Number.		Value.		Number.		Value.				
					Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.			
County.																															
1 King's.....					52	38000	111050	80750	767	1	2000	127	1410	14	1500	18	3500	18	3500	186,820	1	2	3								
2 Queen's.....					55	28890	78890	44155	523	3	600	92	2500	24	1950	24	1950	24	1950	98,189	2	2	2								
3 Prince.....					89	35345	94030	56105	793	4	1950	10	190	6	4700	6	4700	6	4700	146,442	3	3	3								
Totals.....					196	102235	283960	181010	2083	8	4550	159	4100	44	8150	44	8150	44	8150	3500	.....	.....	.....					

SESSIONAL PAPER No. 22

RECAPITULATION

SHOWING Yield and Value of the different Fisheries of the Province of **Prince Edward Island** during the Year 1905.

Kinds of Fish.	Quantity.	Price.		Value.	
		\$	cts.	\$	cts.
Salmon, fresh.....Lb.	19,000	0	20	3,800	00
Herring, salted.....Brls.	12,045	4	50	54,202	50
" fresh.....Lb.	694,000	0	01	6,940	00
" smoked....."	1,500	0	02	30	00
Mackerel, fresh....."	90,700	0	12	10,884	00
" salted.....Brls.	2,397	15	00	35,955	00
Lobsters, cans.....Lb.	2,182,624	0	25	545,656	00
" fresh in shell.....Cwt.	350	7	00	2,450	00
Dried cod....."	18,346	4	50	82,638	00
Tongues and sounds.....Brls.	233	10	00	2,330	00
Haddock, fresh.....Lb.	20,300	0	03	609	00
Haddock, dried.....Cwt.	696	3	00	2,088	00
Hake, dried....."	7,007	2	25	15,765	75
Hake sounds.....Lb.	16,100	0	50	8,050	00
Trout....."	21,400	0	10	2,140	00
Smelts....."	783,620	0	05	39,181	00
Alewives or gaspereaux.....Brls.	735	4	00	2,940	00
Eels....."	1,075	10	00	10,720	00
Caplin....."	220	3	50	770	00
Oysters....."	17,656	5	00	88,280	00
Clams....."	220	4	00	880	00
Clams, in cases.....Cases	460	5	00	2,300	00
Quahaugs.....Brls.	8,035	2	00	16,070	00
Flounders.....Lb.	2,000	0	03	60	00
Tom-cods....."	5,000	0	03	150	00
Squid.....Brls.	115	4	00	460	00
Coarse and mixed fish....."	314	2	00	688	00
Fish oil.....Galls.	9,895	0	30	2,968	50
Fish as bait.....Brls.	37,964	1	50	56,946	00
Fish as manure....."	2,970	1	00	2,970	00
Total, 1905.....				998,921	75
" 1904.....				1,078,546	50
Decrease.....				79,624	85

RECAPITULATION

SHOWING the Number and Value of Vessels, Boats, Nets, Lobster Canneries, Traps, &c.,
used in the fisheries of the Province of Prince Edward Island for the season
of 1905.

Articles.	Value.	Total.
	\$ cts.	\$ cts.
23 fishing vessels (490 tons).....	13,050	
1,940 fishing boats.....	46,656	
5,338 gill nets (91,600 fathoms).....	34,148	
13 seines (2,300 fathoms).....	2,800	
63 trap nets.....	4,450	
361 trawls.....	2,892	
400 smelt nets.....	7,663	
2,299 hand lines.....	2,747	114,406
196 lobster canneries.....	102,235	
283,960 lobster traps.....	181,010	283,245
8 freezers and ice houses.....	4,550	
159 smoke and fish houses.....	4,100	
44 piers and wharfs.....	8,150	
18 steamers and smacks.....	3,500	20,300
Total.....		417,951

Number of persons employed in the fisheries of Prince Edward Island :—

Men in fishing vessels.....	113
Men in fishing boats.....	3,324
Persons in lobster canneries.....	2,083
Total.....	5,520

APPENDIX No. 9.

NEW BRUNSWICK.

District No. 1, comprising the counties of Charlotte and St. John. *Inspector J. H. Pratt, St. Andrews.*

District No. 2, comprising the counties of Albert, Westmorland, Kent, Northumberland, Gloucester and Restigouche. *Inspector R. A. Chapman, Moncton,*

District No. 3, comprising the counties of King's, Queen's, Sunbury, York, Carleton and Victoria. *Inspector H. E. Harrison, Fredericton.*

DISTRICT No. 1.

REPORT ON THE FISHERIES OF DISTRICT NO. 1, NEW BRUNSWICK,
FOR THE YEAR 1905.

ST. JOHN, N.B., January 30, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit herewith my annual report on the fisheries of District No. 1, New Brunswick, for the closing year of 1905, together with the statistics of the several sub-districts and a synopsis of the reports of their officers.

A very gratifying increase of \$67,011. in the value of the catch for the year can be noticed over that of 1904, due almost entirely to an increased herring catch in the county of Charlotte. Only an average catch of herring was made in St. John county, where the price ruled low, owing to an extra good catch in Charlotte county. The prices for cod and pollock kept high during the season, in fact prices for all kinds of fish showed an upward tendency, and now at the end of the year the price for all line fish is higher than it has been for many years.

The statements for the past year's catch collected very carefully place the value at the high figure of \$1,582,402, which is \$297,000 in excess of 1901, which was a very prosperous season in this district.

The value of the material that the fishermen used in the pursuit of their calling, by a careful estimate is estimated at \$865,371, being an increase of \$29,710 over that of 1904, showing that more strenuous efforts are being put forward by our fishermen in order to win a better reward as the results of their labours in the waters of the Bay of Fundy.

With a view of a clearer appreciation of this year's increase in the value of our fisheries, I will quote the value of the catches for the past five years:

1901	\$ 1,285,073
1902	1,064,126
1903	1,067,826
1904	1,515,391
1905	1,582,402

6-7 EDWARD VII., A. 1907

Considerable fishing by the use of dynamite charges being exploded among the schools of pollock that frequented Quoddy river and among the islands, was carried on during the summer season, more especially during our absence cruising on the Nova Scotia coast, but as the fishermen who used this deadly explosive were residents of the state of Maine, detection and capture were very difficult. However, by anchoring off Eastport for a week and assisting the United States officers, several offenders were arrested and heavy fines were imposed by the Eastport magistrate. When it is well known that fully two-thirds of all fish killed by dynamite sink to the bottom and are lost, a faint idea may be formed of the immense destruction caused by the use of this explosive. Although all fishermen are against the use of dynamite on the fishing grounds it is surprising how reticent they all are in giving information to a fishery officer with a view to prevent this most destructive practice.

The replacing of the row and sail boats by those propelled by gasoline engines, is one of the changes now in progress among our fishermen. Almost every one of them desires to possess a motor boat, and as the numerous agents in their anxiety to procure new customers for their firms make the terms of payment quite easy, all obstacles are thereby removed and the fisherman is relieved from the laborious parts of his hazardous occupation. Therefore he is in better physical condition to attend vigorously to his fishing operations when he arrives on the grounds, and thus it will be the means to a large extent of increasing his catch.

DOG FISH.

The dogfish pest is still occupying public attention all along the coasts of the maritime provinces owing to the immense destruction of fishing gear by them, and the consequent loss of time from fishing while those voracious schools of fish frequent our coasts. The establishment of reduction works will no doubt have considerable effect in lessening the numbers of this pest, but as yet none of those factories have been established in the Bay of Fundy. It is admitted that when the dogfish are on the coast, the schools of herring being preyed on by them results in their being driven off shore, thus causing the scarcity so often complained of by fishermen.

Should the proposed canning of dogfish as an article for human consumption become a success, their canning will form quite an important industry in this district, and as they are reported by epicures as being a palatable fish, there is no doubt a market will be discovered for them.

HERRING.

A satisfactory increase will be noticed in the value of pickled herring, while an increase of \$32,552 is the result of the catch of herring suitable for canning purposes. Those fishermen who are in the habit of netting herring on the 'Ripplings' off Grand Manan were pleasantly surprised at finding better fishing than has been found there for the past twenty years, thus proving that the theories of the utter ruin of the 'Ripplings' as a permanent fishing grounds for herring were without any foundation.

The sardine canning factories on the Canadian side, owing to an abundance of suitable herring, packed 694,200 cans more than in 1904, having a value of over \$32,000. As the capture of the herring schools forms the principal occupation of the fishermen in my district, it is a matter of great pleasure to be in a position to report to your department that the season's operations have been so satisfactory to all concerned.

Owing to this large increase in the catch of sardine herring, the numerous sardine canners in the state of Maine increased their output very materially over preceding seasons, and as there has been a considerable amount of carelessness exercised by the canners in their methods this season, it is predicted that there will be a considerable drop in the prices of those sardines not sold during the present winter and next spring, an over-supply of cheap sardine herring invariably results in their being carelessly packed at the factories, and as a natural consequence, a decrease in the price of the goods.

SESSIONAL PAPER No. 22

The rapid settlement of Western Canada by European emigration will ultimately lead to the packing of those fish on the Canadian side as this class of emigrants in the Western States are the principal consumers of the state of Maine pack.

SALMON.

The fishermen report a very successful season in this fishery, and the figures show an increase of 36,810 lb., having a value of \$7,362. During the first part of the salmon season the fish were very scarce, and those who were interested in this fishery, became downcast and disheartened, but soon the schools began to work in shore, and night after night the fishermen were delighted at the large number of this valuable fish that were becoming meshed in their nets.

This fishery has every appearance of a satisfactory annual increase, and its great value warrants every means being adopted in order to encourage and make permanent this increase. A couple of rivers require fishways inserted in their dams, and when they are completed I am certain the fishermen will notice an increase in the salmon schools frequenting our shores each season. During the salmon fishing the weather fortunately was fine, which fact increased the catch materially. A number of the boats each stocked from \$600 to \$700 worth, and one boat lacked only a few dollars from stocking \$1,000 for her season's catch of six weeks duration.

LOBSTERS.

Although it is commonly supposed that this valuable fishery is gradually becoming extinct, the satisfactory returns for the past season show the reverse. Of course many contend, and quite truthfully too, that to secure this increased catch more fishermen and more gear were employed in this fishery. However, the next few years will determine this interesting problem, and as the value of lobsters is higher each year, it is to be sincerely hoped that the fishery will show an increase.

2,988 cwt. is the amount of the past season's increase, having a value of \$29,880. On account of the financial returns therefrom, many fishermen are still sorely tempted to fish for lobsters illegally, but I am pleased to say their numbers are continually lessening, on account of the greater vigilance of the fishery officers.

On account of the law in the adjoining state of Maine allowing lobster fishing to be carried on during the whole year, our fishermen are tempted to engage in the illegal lobster fishing. Several of those persons were captured and fined last year, thus giving a check which will no doubt result in much benefit to this fishery.

Lobster fishing was dull during the winter months, the extremely cold weather probably driving them off shore, but in the month of May they began to come inshore again and good catches were the result. Some good returns in this fishery were made by some of the boats, especially between St. John and Point Lepreaux, one man, for instance, alone in a boat, caught \$170 worth during the month of May. April and June also yielded good returns of catches in St. John county.

POLLOCK.

Nearly 23,000 of this fish were taken, principally in the waters of Quoddy river, although the Grand Manan pollock catch was well up to the average. The prices received by the fishermen were higher than they have ever received before.

The pollock made their first appearance for the year off Grand Manan in the latter part of April and the latter part of May they put in an appearance in Quoddy river, and good fishing resulted during the summer months. A number of weirs at the island of Campobello succeeded in capturing hundreds of quintals of pollock, the stock of one weir especially being placed at over 1,000 quintals.

Some attempts to capture pollock by the use of dynamite were made in the vicinity of the islands in Quoddy river, but through fear of detection and arrest very little dynamite was used by the lawless element in Canadian waters.

6-7 EDWARD VII., A. 1907

COD AND HADDOCK.

A slight decrease will be noticed in the catch of cod, but the very high prices prevailing during the whole year amply compensated the fishermen for the decrease of 2,000 quintals in the catch. Haddock were quite scarce all the season, and although extremely good prices were paid the fishermen for their catch, the returns will show a decrease in value of nearly \$15,000, the total value of the catch being \$40,080.

COCKLES.

More of our fishermen are engaging in this remunerative fishery, and all the catch is exported fresh to Boston where it is eagerly sought after by fishermen on the George's Banks. It is reported on good authority that a cockle is the only kind of bait that a dogfish will not eat, while he will ravenously devour all other kinds of bait.

High prices are paid the fishermen for all the cockles they can procure, and \$1,800 was the result of their very short season's work. This fishing is only carried on in the vicinity of St. Andrews, but there is no question, that it will soon extend to other parts of the Canadian coast.

SYNOPSIS OF FISHERY OFFICERS' REPORTS.

Overseer Frazer, of Grand Manan, states that an increase of \$50,000 will be noticed this year over that of 1904. This increase will be found in the herring fishery, large quantities of them being kippered, canned, and smoked. An increase will also be noticed in the lobster fishery, good prices being received for them. A small decrease will be seen in the catch of cod, haddock, and pollock, with the prices of all kinds of fish ruling high. About 90 per cent of our fisheries both fresh and manufactured, go to foreign markets, most of them to the United States. The close seasons were quite well observed, and the patrol boat assisted very materially in carrying out all the regulations.

A number of the prominent fishermen are going into the business of putting up boneless herring, an industry that can be profitably carried on here on account of the abundance of material being right at hand. Herrings fit for the bloater trade have been very scarce and a large grade of medium herrings have been taking their place, and they find a ready sale at remunerative prices.

Overseer Savage, of Campobello, reports that herring of all sizes were more plentiful than last year, but as the demand was limited the prices were forced down to a low figure. Our fishermen neglected the sardine fishing owing to the low prices, and turned their attention to line fishing. The returns will show that the quantities of sardines taken in this district was very small. There was a large increase in the catch of lobsters, owing not only to better fishing, but also to the change in the size limit which allows the fishermen to take nine inch lobsters. As nearly double the number of traps were fished than last year, this may have something to do with the increased catch. Prices were high for shipping in the shell, and also in the canneries.

All kinds of fish were plentiful and prices were higher than ever before received, with the exception of sardine herring. Owing to the large catches of pollock being made in a number of weirs, the total catch of that fish exceeds that of 1904, with the prices exceedingly high.

Overseer Billings, of the St. Andrews division, reports a large increase in the catch of sardine herring but less money received on account of the low prices prevailing throughout the year. During several months, while the fish were very plentiful, the owners of the weirs received but \$1.50 per hogshead. The few weirs that had contracts with the Eastport factory owners, received the contract price of \$4 per hogshead.

SESSIONAL PAPER No. 22

There was an increase in the take of clams but the prices remained the same as last season. Owing to the regulations regarding clams being strictly enforced the beds are remaining in very good condition, and no doubt will yield a permanent supply.

Some attempts were made at illegal lobster fishing but several of the offenders having being promptly arrested and fined, the others ceased operations suddenly.

I am, sir,

Your obedient servant,

JOHN H. PRATT,

Inspector of Fisheries.

DISTRICT No. 2.

COMPRISING THE COUNTIES OF ALBERT, WESTMORLAND, KENT,
NORTHUMBERLAND, GLOUCESTER AND RESTIGOUCHE.

MONCTON, March 3, 1906.

The Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit my report of the fisheries in District No 2 of the province of New Brunswick, consisting of the counties of Restigouche, Gloucester, Northumberland, Kent, Westmorland and Albert, together with the parish of Stanley in the County of York, and the parish of Aberdeen in the county of Carleton, for the year 1905, with tabulated statements, giving the products and values by districts and counties, together with an estimate of the capital employed in the prosecution of these fisheries.

These returns show an increase in the aggregate values over those of previous years.

I will now briefly refer to the principal kinds of fish caught.

SALMON.

The catch was very much larger than in 1904, and not only our rivers and streams, but the waters of our coasts were teeming with them after the fishing season closed, which ensures good fishing in future.

SHAD.

Less taken than ever, these fish are getting scarcer and dearer every season. Years ago they were sold at from three to four cents each, now they bring from 20 to 25 cents; then a boat in a few hours would net four or five hundred fish, as many as are now caught in a month. Nothing will restore this valuable fishery but a close time during the spawning season, say until the 20th June.

HERRING.

The spring run on every part of our coast was simply immense, and increased quantities were taken for every purpose for which they are used, the catch later on the Caraquet and Miscou banks, was hardly up to average, these latter are good fish and with more care in curing would bring good prices.

MACKEREL.

About the same as in 1904.

SESSIONAL PAPER No. 22

COD.

I have to report a falling off in this fishery from previous years of about fourteen thousand cwts. of dry fish, caused principally by the want of bait early in the season, and the dogfish nuisance later. Prices were very high, which helped the fishermen out somewhat. Provision should be made to ensure a supply of bait at all times.

SMELTS.

Though the catch for the months of January and February, 1905, was rather below the average, the weather was very cold and the fish were got to market in perfect condition, bringing extra prices, which made up fully for the slightly smaller quantities, but owing to the weather being so mild and changeable during the past winter, they reached market in poor condition, prices ran down, consequently considerable quantities are still held by shippers, and it is indeed fortunate that no extension was granted in February.

LOBSTERS.

In the aggregate, about three thousand cases (140,000 cans) more were packed than in previous year; the gain was principally on the coast between Chockpish and Miscou; at Caraquet and some other places on the Baie des Chaleurs the catch was small, entailing some loss to the canners.

OYSTERS.

I find the quantity raked was not quite up to that of previous season, but prices were very high. Owing to good employment elsewhere, not quite so much attention is given to this fishery at Bay du Vin and other points on the Miramichi river, as formerly, and at Buctouche, Cocagne, &c., hard shell clams (Quahaugs) are of much more importance than oysters.

CLAMS.

Immense quantities, especially of quahaugs, have been raked again this year, while reserving the oyster areas in the several harbours during spawning time is doing much good, by enabling the clams on such areas to spawn, which spawn is carried by the currents and winds to all parts of such bays and harbours. Some regulations governing this fishery should be made giving space between teeth of rakes used, so as to prevent the taking of very small ones; licenses also should be issued to give our officers better control.

I have the honour to be, sir,

Your obedient servant.

R. A. CHAPMAN,

Inspector of Fisheries.

DISTRICT No. 3 (Inland).

COMPRISING THE COUNTIES OF KING'S, QUEEN'S, SUNBURY, YORK,
CARLETON AND VICTORIA.

FREDERICTON, N.B., February 20, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit my annual report on the fisheries of District No. 3, in the province of New Brunswick, for the year 1905, showing the quantity and value of fish taken, also the materials and value of same used in connection with the fisheries of this district.

A comparative statement of the value of fish taken and materials used in 1904 and 1905 is herewith given, viz. :—

Value of Fish.

In 1904	\$65,256
“ 1905	65,387

showing a very slight increase for 1905.

Value of Materials

In 1904	\$54,781
“ 1905	55,348

an appreciable increase for last year.

There are some features of the past season's fishing which are very gratifying to all concerned, and I wish to mention particularly the splended runs of salmon in the St. John river, especially noticeable near the head of tidal-water, and the splendid surface-fly fishing enjoyed by the Tobique Salmon Club. This branch of our fishing was, perhaps, not any better in 1905 than the previous season, in the lower counties, viz. :—King's, Queen's and Sunbury, but there is a notable increase in York county. The reason for this may be that the ice in the river broke up much earlier than usual and gave fishermen a chance to set their nets before the salmon got past on their way to the spawning grounds. I trust the number stopped here, will not, in the future, affect the supply. It did not seem to do so the past season as the sport on the Tobique was excellent, although some say that the fish do not appear to be of such good size as formerly. A very pleasing feature in connection with the past season was the discovery of a very interesting salmon pool about five miles from Fredericton. This was only made known about two weeks before the close season (August 15), but, in those two weeks more real sport was enjoyed by, probably one hundred persons, many of whom have not the time and means to take a trip very far from home, than they ever hoped to have in this line of sport. While no large fish were taken with the fly about forty nice grilse were. We look for great sport here in the future and hope to be in a position to give this part of the river special protection. Other fish, with the exception of trout, were taken in about the same quantities as usual. There is quite a falling off in the quantity of trout. Fishery officers ascribe it to the unprecedented low state of the water in all trout resorts.

SESSIONAL PAPER No. 22

The fishery law has, generally, been very well observed. We still have some trouble in the county of King's regarding the dumping of sawdust into the stream, but I think not as much as formerly. Probably we have more violations, with regard to the taking of fish, in York county than anywhere else. There is greater opportunity to do so than elsewhere in my district. The extra men allowed me for a few weeks last season resulted in much good being done. Much illegal fishing, drifting with net at night, was prevented, some seizures of nets and other materials made, and a few small fines collected.

SALMON.

As previously stated in this report the salmon fishing, generally, was very successful and indicates that the protection we are giving, along with the very efficient protection given by the Tobique Salmon Club to these fish on their way to and after they have reached their spawning grounds, is bearing good fruit. I am satisfied that if we could place a sufficient number of good special guardians on about fifty miles of the St. John river, from the head of tidal-water up, and the present restrictions regarding the issuing of fishery licenses continued, the run of salmon in a few years would be immense. As stated in my report for 1904, I would like to see the license of 3 cents raised to 5 cents per fathom.

SHAD.

A gratifying increase in the quantity of shad taken, salted and used in the fresh state, is reported by the fishery officers. The market for shad seems to be unlimited as when properly salted they are an excellent fish for winter and much sought after. Our shad fishermen receive a good sum for the fish.

HERRING.

The quantities of these fish, taken, does not seem to vary to any extent, from year to year, and are reported only from the districts near the salt water.

ALEWIVES.

The quantity of alewives reported as taken show a slight decrease. I was of the opinion that this would be so, from conversations with fishermen early in the season. Possibly the industry was not prosecuted to as great an extent as in some former years. The market, however, was good and fishermen had no trouble in disposing of their catches.

TROUT.

I have to report a falling off in the quantity of trout taken in the past season. This little game fish is looked upon as the most general sport producer, and if they are shy or scarce it is very generally known and a host of people spend more or less time in their pursuit. The very low condition of water in all the lakes and brooks the past season is supposed to be the cause of the smaller quantity taken. I wish, here, to thank your department for the interest taken in producing a stock of trout fry from the Bartibog Hatchery on the 14th of June and taken to and placed in Magaguadavic and Davidson lakes by Overseer McKay and Dr. E. W. Henry, of this city. These fry were received in very good condition and I trust will be of benefit to these lakes.

PICKEREL.

There was considerably less of this fish taken in 1905 as compared with the previous year. I have been requested to bring to the attention of the Fishery Department the advisability of making it illegal to fish for pickerel with a net of less size than three inches mesh. It is claimed that a great amount of undersized fish are taken at

6-7 EDWARD VII., A. 1907

present. A change as suggested would, no doubt, be to the advantage of fishermen in a short time.

BASS.

Practically none of these fish are taken in this district. A few licenses are granted and a small quantity of bass caught for domestic use.

STURGEON.

I can report with satisfaction a small increase in the quantity of sturgeon taken. While the total amount is not large, as reported, the per centage of increase in both fish and caviare is very good. I trust, with good protection this industry will again grow to large proportions.

SYNOPSIS OF REPORTS FROM FISHERY OFFICERS, 1905.

KING'S COUNTY.

S. G. Coggin, Sussex, reports the law well observed in his district. Trout fishing not as good as usual. It is thought the water was too low. Three very nice salmon, weight from 10 to 13 pounds taken with the fly in the Kennebecasis, near Sussex.

S. G. Myers, Norton Station, reports fishing generally not as good in his district as it was in 1904.

S. G. McCready, Penobsquis, reports trout fishing poor on account of very low conditions of streams.

S. G. Dunham, Grey's Mills, reports fishing in his district much better than usual.

QUEEN'S COUNTY.

Overseer Hetherington, Queen's East, reports the fisheries, generally, in his district as being in a fairly prosperous condition. Shad fishing particularly is prosecuted to a very much greater extent than it was a few years ago, and a greater demand for this fish than he ever knew before. He again suggests that a license fee of \$1 per net be put on shad fishing. Evidently there are some young sturgeon in these waters as Mr. Hetherington says they are a curse to shad nets. He reports the law fairly well observed.

Overseer Bullyea, Queen's West, reports that his special guardians attended well to their duties, the law very well observed, and fishing about as usual.

SUNBURY COUNTY.

Overseer McLean, Sunbury County, reports alewives very plentiful and sales good. The catch of shad was very good, but catch of salmon is light. He thinks the first good run came so early that they got by before fishermen got their nets set. Mr. McLean corroborates Mr. Hetherington's statement that pickerel are becoming small and thinks it would be advisable to amend the law so that the meshes of pickerel nets would not be less than three inches. Mr. McLean recommends that a fishway be built in the Hartt Mill dam near Fredericton Junction. No violations reported by special guardians.

YORK COUNTY.

Overseer McKay, of Fredericton, reports that the salmon fishing in the St. John river during the season just closed has been very far above the average for a number of

SESSIONAL PAPER No. 22

years. Many of the fishermen claim there were more salmon grilse in the river last season than any other for the last twenty-five years.

On the Southwest Miramichi, the run of salmon is gradually falling off each year, and the last season was unusually poor. Accordingly foreign sportsmen are also decreasing. Angling at the head of the river in Carleton county is quite extensively carried on by fishermen from the upper St. John river and the local inhabitants, chiefly for trout. He attributes the scarcity of salmon to overfishing in the tidal waters of the Miramichi, particularly below Chatham, where two shipping fish merchants are located.

The catch of trout is much less than last year both in our local streams and in the lakes as Oromocto, Harvey, Skiff and Magaguadavic lakes, all of which are very close to railway accommodations, and if well supplied with trout, Americans would build cottages and with their families remain at these nearly all summer. A few have already done so and others would follow if good fishing could be relied upon.

Reports say that considerable illegal fishing is being done at Oromocto and Harvey lakes in the early spring. Some few get a trout license and there being no guardian on duty at that time many others are said to take advantage of that fact and go along as if they also had licenses. I would therefore recommend that the guardian be appointed about March 15 or April 1, at the latest, and to remain on duty during your pleasure. Shad and other fish are about the same as last year.

A very pleasing feature of my report is a new departure in the mode of fishing on the St. John river. I refer to surface-fly fishing for salmon. About August 1 last, two local sportsmen were induced by Guide Thos. Phillips to try their luck at a pool about five miles above the city of Fredericton, where they had the good fortune to land two salmon each during the afternoon. The good news spreading rapidly throughout the city brought lots of sportsmen to the scene, with the result that up to the beginning of the close season (August 15), over forty salmon and grilse were taken. One keen sportsman, Mr. Thos. Peters, Deputy-Commissioner of Agriculture for New Brunswick, on last day of the season tried another pool about two miles further up the river and had the pleasure to land a six pound salmon. The whole being a most excellent showing and gives a positive contradiction to the often reported remark that salmon would not rise to a fly in St. John river. These gentlemen, very naturally and justly so, feel proud in being the pioneers in this most excellent sport, and it is to be hoped as the seasons come and go, many other pools will be found until the river will equal, and perhaps excel, any other in the province in giving sportsmen the enjoyment they have so often wished for.

I regret to have to report Wellington Davies' death, at about Nov. 1, 1905. He was guardian of Kedron lake and Magaguadavic river and lake. *Re* filling his position I will report to you in the near future but at present think it might be divided between Guardians Stack and James. Will also ask some change in protection at the St. John river.

CARLETON COUNTY.

Special Guardian Brooks reports some infractions of the Fishing Act, but, although he did what he could to enforce the regulations and prevent a deal of illegal fishing yet some was done, and he was unable to get the names of the parties.

VICTORIA COUNTY.

The officer was unable to get a report from the Tobique Salmon Club, but from others who are acquainted with the state of the fisheries in that river, and from information I got from parties who fish on that river we learn that it was again a splendid

6-7 EDWARD VII., A. 1907

season. The special guardians under Mr. LeClair attend well to their duties, and I would not forget to give the Tobique Club their due credit for the very efficient protection they give the salmon after they reach that river.

Overseer Gagnon reports a decrease in the catch of trout in some parts of his district, and like other fishery officers thinks it is because of the very low condition of the streams. With the exceptions of a few minor infractions, the fishery law was well observed. All his special guardians have done their duties satisfactorily.

I have the honour to be, sir,

Your obedient servant,

H. E. HARRISON,

Inspector of Fisheries.

SESSIONAL PAPER No. 22

NEW BRUNSWICK—DISTRICT No. 1.

RETURN showing the Number, Tonnage and Value of Vessels, and Boats and the Quantity and Value of all Fishing Materials and the kinds of Fish, &c., in the Counties of Charlotte, and St. John, Province of New Brunswick, for the Year 1905.

Fishing Districts.	Fishing Vessels and Boats.						Fishing Gear or Materials.						Kinds of Fish.								
	Vessels.			Boats.			Gill-nets.			Seines.			Weirs.		Herring, kippered, cans	Herring, salted, brls.	Herring, fresh, lb.	Herring, smoked, lb.	Scallops, in shell, brls.	Scallops, canned.	
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.							
Charlotte Co.																					
1	Lepreau to Red Head	9	60	4700	18	67	1250	62	30	1350	600	18	600	1100	20	12000	6000	100000	60	20000	1
2	Red Head to Letang	9	130	2000	28	83	1690	85	83	2500	1200	35	1050	1100	30	9400	210000	210000	140	20000	2
3	Letang to St. George.	7	112	3400	40	270	4800	175	150	3600	1500	95	3055	5500	69	31000	17000	30000	18000	140	3
4	St. George to St. Stephen	1	14	1000	2	280	5500	190	92	2900	6000	92	2900	6000	92	37000	40000	35000	18000	140	4
5	Grand Manan.	54	890	35000	202	155	29000	250	970	29000	10000	41	1400	4500	43	54000	196800	415000	435000	1000	5
6	Campobello	12	279	8000	60	212	9000	200	95	4000	1300	30	850	1500	24	8500	40000	13000	8200	1000	6
7	West Isles.	5	1000	3000	15	128	9000	160	100	2000	1000	125	4000	8000	85	50000	50000	13000	8200	1000	7
8	St. George and vicinity.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Totals.		97	2485	57100	365	1195	60240	1122	1428	43070	15600	436	13865	27700	363	201900	6000	57000	211800	7965	20000
St. John Co.																					
1	St. John Harbour	3	60	600	15	150	14000	260	294	16000	4800	7	560	600	23	7500	45000	100000	.....	.....	1
2	Lepreau to Chance Harbour.	5	120	2700	28	40	16000	40	95	11000	1200	4	240	400	.....	51150	.....	.....	.....	.....	2
3	Chance Harbour to Mispic.	10	148	3500	50	200	10000	300	1023	76725	10500	30	1500	1800	11	3300	228960	.....	.....	.....	3
4	Mispic to Tynemouth Creek.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
5	Tynemouth Crk to Albert Co.	1	10	1000	3	22	440	22	25	1250	350	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Totals		19	338	7800	91	442	40790	682	1437	104975	16850	41	2300	2800	34	10800	325110	100000	.....	.....	.....
Grand totals.		116	2823	64900	456	1637	101030	1804	2865	148025	32450	477	16165	30500	397	212700	331110	157000	211800	7970	20000

6-7 EDWARD VII., A. 1907

RETURN showing the Kinds and Quantities of Fish and Fish Products
Brunswick, for the

Number.	FISHING DISTRICTS.	KINDS										
		Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod, fresh or frozen, lb.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked, finnan haddies, lb.	Hake, dried, cwt.	Hake, sounds, lb.	Pollock, cwt.	Halibut, lb.
	<i>Charlotte Co.</i>											
1	Lepreau to Red Head		1280						210		120	
2	Red Head to Letang	9600	3150	400	51000	17000	500	41000	6530	7550	350	
3	Letang to St. George		840	250	76000	75000			900	400	2000	
4	St. George to St. Stephen		400	54	13000	216000		7500	600	1400	26	960
5	Grand Manan	56640	3310	1540	201000	42500	875	15400	*6000	6500	4515	4400
6	Campobello	24000	560	380	47000	618000			6250	6300	13050	11000
7	West Isles		235	100	2000	10000					1000	
8	St. George and vicinity											
	Totals	90240	9775	2724	390000	978500	1375	63900	20490	22150	21061	16360
	<i>St. John Co.</i>											
1	St. John City											
2	Lepreau to Chance Harbour		106	17		150000			1120	1200		
3	Chance Harbour to Mispec		900	700			700		500		112	
4	Mispec to Tynemouth Creek		650	75							1400	
5	Tynemouth Creek to Albert Co.		729								8	
	Totals		2385	792		150000	700		1620	1200	1520	
	Grand totals	90240	12160	3516	390000	1128500	2075	63900	22110	23350	22581	16360

* Add 57,600 cans of hake at 10 cents.

In No. 2 add 200 lbs. of tom-cod and 2,000 lbs. of trout.

† 26,100 of these cans are clam juice. Add also 360 brls. of cockles.

SESSIONAL PAPER No. 22

in the Counties of St. John and Charlotte, Province of New
Year 1905—Continued.

OF FISH.													TOTAL VALUE OF ALL FISH.	Number.
Shad, brls.	Smelts, lb.	Alewives or gaspereau, brls.	Eels, brls.	Sardines, brls.	Sardines, canned, cans.	Flounders, lb.	Squid, brls.	Clams, in shell, brls.	Clams, canned, cans.	Fish Oil, galls.	Fish as bait, brls.	Fish as manure, brls.		
.....	4000	.....	.....	6000	.....	.....	.....	2210	131100	.....	4000	.....	8 cts.	
.....	.....	.....	.....	16000	1817000	2600	.....	150	40000	6600	400	1500	48,622 50	1
.....	2000	.....	.....	110296	1700000	.....	.....	240	.....	700	453	.....	197,675 50	2
.....	6000	.....	.....	88000	.....	.....	.....	3172	207300	12	3000	.....	330,241 50	3
.....	.....	.....	.....	35200	.....	.....	.....	.....	.....	10000	4200	106000	222,914 10	4
.....	.....	.....	.....	8000	.....	.....	75	.....	.....	13180	1600	.....	339,454 00	5
.....	3000	.....	.....	69000	130000	.....	10	.....	4800	3000	100	.....	102,755 50	6
.....	20000	400	.....	.....	.....	.....	.....	200	.....	.....	.....	.....	151,400 00	7
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,006 00	8
....	35000	400	....	332496	3647000	2600	85	5972	383200	33492	13753	1500	1,396,069 10	10
800	.....	11000	150	4000	25000	.....	.....	.....	.....	.....	2000	1500	85,050 00	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	800	300	.....	19,676 50	2
75	.....	625	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	64,641 00	3
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9,637 50	4
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,328 50	5
875	.....	11625	150	4000	25000	.....	.....	.....	.....	800	2300	.....	186,333 50	
875	35000	12025	150	336496	3672000	2600	85	5972	383200	34292	16053	1500	1,582,402 60	

RECAPITULATION

OF the Yield and Value of the Fisheries in District No. 1, New Brunswick, comprising the Counties of St. John and Charlotte, for the Year 1905.

Kinds of Fish.	Quantity.	Price.		Value.	
		\$	cts.	\$	cts.
Salmon, fresh in ice.....Lb.	331,110	0	20	66,222	00
Herring, kippered....."	157,000	0	10	15,700	00
" " canned.....Cans.	211,800	0	10	21,180	00
" salted.....Brls.	7,970	4	50	35,865	00
" fresh or frozen.....Lb.	768,000	0	01	7,680	00
" smoked....."	4,565,200	0	02	91,304	00
Lobsters, fresh.....Cwt.	12,160	10	00	121,600	00
" canned.....Cans.	90,240	0	25	22,560	00
Cod, dried.....Cwt.	3,516	4	50	15,822	00
" fresh or frozen.....Lb.	390,000	0	04	15,600	00
Haddock, fresh....."	1,128,500	0	03	33,855	00
" dried.....Cwt.	2,075	3	00	6,225	00
" smoked finnan haddies.....Lb.	63,900	0	06	3,834	00
Hake, dried.....Cwt.	22,110	2	25	49,747	50
" sounds.....Lb.	23,350	0	50	11,675	00
" canned.....Cans.	57,600	0	10	5,760	00
Pollock, dried.....Cwt.	22,581	2	00	45,160	00
Halibut, fresh.....Lb.	16,360	0	10	1,636	00
Trout....."	2,000	0	10	200	00
Shad.....Brls.	875	10	00	8,750	00
Smelts.....Lb.	35,000	0	05	1,750	00
Alewives.....Brls.	12,025	4	00	48,100	00
Dulse.....Lb.	119,500	0	06	7,170	00
Eels.....Brls.	150	10	00	1,500	00
Sardines, preserved.....Cans.	3,672,000	0	05	183,600	00
" fresh.....Brls.	336,496	2	00	672,992	00
Flounders.....Lb.	2,600	0	03	78	00
Tom-cod or frost fish....."	200	0	03	6	00
Squid.....Brls.	85	4	00	340	00
Clams in shell....."	5,972	1	00	5,972	00
" canned.....Cans.	357,100	0	10	35,710	00
" juice....."	26,100	0	10	2,610	00
Scallops, in shell.....Brls.	1,140	2	00	2,280	00
" preserved.....Cans.	20,000	0	15	3,000	00
Fish oil.....Galls.	34,292	0	30	10,287	60
" used as bait.....Brls.	16,053	1	50	24,079	50
" " manure....."	1,500	0	50	750	00
Cockles....."	360	5	00	1,800	00
Total value of catch for 1905.....				1,582,402	60
" " 1904.....				1,515,391	30
Value of increase for 1905.....				67,011	30

SESSIONAL PAPER No. 22

RECAPITULATION

OF the Number and Value of Vessels, Boats, Nets, Weirs, &c., engaged in the Fisheries of District No. 1, New Brunswick, comprising the Counties of St. John and Charlotte, for the Year 1905.

Number.	Material.	Value.
		\$ cts.
116	Vessels, tonnage 2,823.....	64,900 00
1,637	Boats.....	101,030 00
2,865	Gill-nets, fathoms 148,025.....	32,450 00
477	Weir seines " 16,165.....	30,500 00
881	Trawls.....	8,505 00
397	Wiers.....	212,700 00
36	Smelt-nets.....	340 00
2,208	Hand lines.....	1,685 00
4	Lobster canneries.....	8,500 00
25,926	" traps.....	26,321 00
16	Freezers and ice houses.....	5,800 00
747	Smoke and fish houses.....	179,400 00
310	Piers and wharfs.....	98,000 00
113	Tugs and smacks.....	21,300 00
5	Sardine canneries.....	41,000 00
5	Clam ".....	6,500 00
5	Fish curing factories.....	10,000 00
1	Fish guano ".....	5,000 00
40	Fish presses.....	600 00
166	Pile drivers.....	4,300 00
154	Weir scows.....	6,540 00
	Total value of material.....	865,371 00

6-7 EDWARD VII., A. 1907

NEW BRUNSWICK—

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING	
		Vessels.				Boats.		Gill	
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Fathoms.
				\$			\$		
	<i>Restigouche County.</i>								
1	Above Dalhousie.....					22	540	30	22
2	Below Dalhousie.....	1	26	900	4	200	4000	365	138
	Totals	1	26	900	4	222	4540	395	160
	<i>Gloucester County.</i>								
3	Beresford and part of Bathurst					445	10000	880	1500
4	Caraquet, New Bandon and part of Bathurst.....	130	1550	54000	500	510	17000	1100	2100
5	Saumarez, Inkerman and Shippegan mainland	25	270	10000	102	265	7000	550	4090
6	Shippegan and Miscou islands.....	66	810	32000	240	480	20000	1000	1200
	Totals.....	221	2630	96000	842	1700	54000	3530	7800
	<i>Northumberland County.</i>								
7	Neguac and vicinity.....	4	74	2000	14	210	7000	600	650
8	Bay du Vin and vicinity.....	3	40	1200	9	220	9000	700	760
9	Chatham and vicinity.....	1	10	300	3	150	4500	400	420
10	Southwest and Northwest Miramichi rivers.....					125	2000	150	370
	Totals	8	124	3500	26	705	22500	1850	2200
	<i>Kent County.</i>								
11	Richibucto, St. Louis, Carleton, &c.....					295	10775	465	4300
12	Buctouche and vicinity.....					510	14500	820	3000
13	Cocagne and vicinity.....					380	7000	560	1100
	Totals					1185	32275	1845	8400
	<i>Westmorland County.</i>								
14	Shediac, Moncton and Salisbury.....					420	13000	720	800
15	Botsford.....					475	13500	765	650
16	Sackville and Westmorland.....					255	5000	355	500
17	Dorchester.....					30	1700	58	160
	Totals					1180	33200	1898	2110
18	<i>Albert County</i>					15	500	25	20
	Grand totals.....	230	2780	100400	872	5007	147015	9543	20690

6-7 EDWARD VII., A. 1907

RETURN showing the Kinds and Quantities of Fish and Fish Products in the

Number.	DISTRICTS.	KINDS OF FISH									
		Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, dried, cwt.	Hake, dried, cwt.	Hake sounds, lb.	Halibut, lb.	Trout, lb.	Shad, brls.
	<i>Restigouche County.</i>										
1	Above Dalhousie.....		1 0							6500	
2	Below Dalhousie.....	28000	150	40						3800	
	Totals.....	28000	260	40						10300	
	<i>Gloucester County.</i>										
3	Beresford and part of Bathurst.....	18400	200	2800			200			10000	
4	Caraquet, New Band on and part of Bathurst	192000	600	35000	150		1600	2000	60000	14000	
5	Saumarez, Inkerman and Shippegan mainland	102600	200	9200	40	1000	1600	2000	11000	4000	50
6	Shippegan and Miscou islands.....	564800	150	22000	100		2000	2400	35000	400	
	Totals.....	877000	1150	69000	290	1000	5400	6400	106000	28400	50
	<i>Northumberland County.</i>										
7	Neguac and vicinity.....	105000	200	1800		300	800	500	2800	6000	160
8	Bay du Vin and vicinity.....	82600	200	1000		250	200		3000	1800	110
9	Chatham and vicinity.....			120		200	100			4500	400
10	Southwest and Northwest Miramichi rivers.									26000	800
	Totals.....	187600	400	2920		750	1100	500	5800	38300	1470
	<i>Kent County.</i>										
11	Richibucto, St. Louis, Carleton, &c.....	256600	2500	1350		140	2000	1600	4000	5000	180
12	Buctouche and vicinity.....	140000	100	100			200			2100	
13	Cocagne and vicinity.....	41000	150	120			60			2500	
	Totals.....	457600	2750	1570		140	2260	1600	4000	9600	180
	<i>Westmorland County.</i>										
14	Shediac, Moncton and Salisbury.....	192000	300	100			40			14000	25
15	Botsford.....	432000	1200							9000	25
16	Sackville and Westmorland.....	5000	200							2500	150
17	Dorchester.....									3000	800
	Totals.....	629000	1700	100			40			28500	1000
18	<i>Albert County.</i>		100							11000	80
	Grand totals.....	2159200	6360	73630	290	1890	8800	8500	115800	126100	2780

SESSIONAL PAPER No. 22

Counties of District No. 2, Province of **New Brunswick**, for the Year 1905.

AND FISH PRODUCTS.

Smelts, lb.	Alewives or Gaspe- reau, brls.	Bas, lb.	Eels, brls.	Oysters, brls.	Clams, brls.	Flounders, lb.	Tom-cod or frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	TOTAL VALUE OF ALL FISH.	Number.
														\$ cts.	
173700	.....	.....	13	.....	.....	30000	20000	.....	80	.....	10	60	.....	23,224 00	1
26500	.....	1000	43	.....	.....	2000	11000	.....	.....	.....	400	600	.....	43,660 00	2
200200	.....	1000	56	.....	.....	32000	31000	.....	80	.....	410	660	.....	66,884 00	
1500	...	1500	45	.....	750	16500	14000	15	175	300	1600	25000	8	119,615 00	3
300000	...	7000	200	800	4200	30000	160000	400	800	14000	10000	25000	16	508,145 00	4
410000	100	5000	200	50	9000	15000	20000	160	2000	1700	2400	6000	28	232,955 00	5
260000	...	7000	100	50	2050	10000	10000	180	1000	7000	12000	15000	32	379,430 00	6
971500	100	20500	545	900	16000	71500	204000	755	3975	23000	26000	71000	84	1,240,145 00	
950000	100	10000	100	1000	400	20000	150000	...	200	200	2000	10000	12	195,474 00	7
565000	300	4000	200	6500	100	60000	150000	.....	2000	100	4000	20000	8	172,455 00	8
1560000	300	5000	40	800	100	300000	1200000	.....	.....	50	40	100	.....	155,860 00	9
15000	800	86000	600	.....	.....	.....	60000	.....	.....	.....	.....	.....	.....	52,650 00	10
3090000	1500	105000	940	8300	600	380000	1560000	..	2200	350	6040	30100	20	576,439 00	
998000	1300	17000	750	650	350	32000	60000	17	250	600	3200	5000	12	246,528 00	11
360000	600	1800	150	2000	15000	.....	60000	.....	3000	.....	4500	14000	.....	191,080 00	12
190000	400	1200	100	1250	13000	20000	10000	.....	.....	.....	1000	5000	.....	96,111 00	13
1548000	2300	20000	1000	3900	28350	52000	130000	17	3250	600	8700	24000	12	533,719 00	
450000	400	3600	200	800	3500	.....	25000	.....	800	.....	16000	40000	.....	325,700 00	14
300000	200	2000	100	300	2000	.....	20000	.....	.....	.....	26000	30000	.....	290,950 00	15
90000	200	2500	75	100	100	.....	10000	.....	.....	.....	4000	6000	.....	147,330 00	16
.....	.....	.....	60	.....	.....	.....	5000	.....	100	100	.....	.....	.....	10,430 00	17
840000	800	8100	435	1200	5600	...	60000	.....	900	100	46000	76000	..	774,410 00	
4000	...	600	60	.....	10	...	25000	.....	...	40	...	.....	.....	6,252 00	18
6653700	4700	155200	3036	14300	50560	535500	2010000	772	10405	21090	87150	201760	116	3,197,849 00	

6-7 EDWARD Vil., A. 1907

RECAPITULATION

Of the Yield and Value of the Fisheries in District No. 2, New Brunswick, for
the Year 1905.

Kinds of Fish.	Quantity.	Price.	Value.
		\$ cts.	\$
Salmon, fresh..... Lb.	1,167,270	0 20	233,454
" preserved in cans..... "	4,300	0 15	645
" smoked..... "	7,500	0 20	1,500
Herring, salted..... Brls.	167,900	4 50	755,550
" fresh..... Lb.	2,155,000	0 01	21,550
" smoked..... "	9,752,000	0 02	195,040
Mackerel, fresh..... "	268,500	0 12	32,220
" salted..... Brls.	280	15 00	4,200
Lobsters, preserved..... Cans	2,159,200	0 25	539,800
" in shell..... Cwt.	6,360	6 00	38,160
Cod, dried..... "	73,630	4 50	331,335
" tongues and sounds..... Brls.	290	10 00	2,900
Haddock..... Cwt.	1,890	3 00	5,670
Hake..... "	8,800	2 25	19,800
" sounds..... Lb.	8,500	0 50	4,250
Halibut..... "	115,800	0 10	11,580
Trout..... "	126,100	0 10	12,610
Shad..... Brls.	2,780	10 00	27,800
Smelts..... Lb.	6,653,700	0 05	332,685
Alewives..... Brls.	4,700	4 00	18,800
Bass..... Lb.	155,200	0 10	15,520
Eels..... Brls.	3,036	10 00	30,360
Oysters..... "	14,300	5 00	71,500
Clams..... "	50,560	3 00	151,680
Flounders..... Lb.	535,500	0 03	16,065
Frost fish or tom cod..... "	2,010,000	0 03	60,300
Squid..... Brls.	772	4 00	3,088
Coarse fish..... "	10,405	2 00	20,810
Fish oil..... Galls.	24,090	0 30	7,227
Fish as bait..... Brls.	87,150	1 50	130,725
Fish as manure..... "	291,760	0 50	100,880
Seal skins..... No.	116	1 25	145
Total.....			3,197,849

SESSIONAL PAPER No. 22

RECAPITULATION

OF the Number and Value of Vessels, Boats, Nets, Traps, &c., engaged in the Fisheries
in District No. 2, **New Brunswick**, in the year 1905.

Material.	Value.	Total.
	\$	\$
230 fishing vessels (2,780 tons)	100,400	
5,007 " boats	147,015	
676,400 fathoms gill-nets.....	364,500	
389 trawls.....	1,960	
174 bass-nets.....	1,060	
2,402 smelt-nets.....	136,400	
5,775 hand-lines.....	4,115	
194 lobster canneries.....	102,100	755,450
243,350 lobster-traps	220,450	
192 freezers and ice-houses.....	70,600	322,550
435 fish and smoke houses	45,640	
49 piers and wharfs.....	29,800	
69 tugs and smacks.....	23,500	
853 smelt shanties.	13,800	
		183,340
Total... ..		1,261,340

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish in District No. 3, Province of New Brunswick, 1905.

Number.	Counties.	Herring, fresh, lb.	Whitefish, lb.	Trout, lb.	Bas, lb.	Pickarel, lb.	Shad, fresh, lb.	Sturgeon, lb.	Fels, brls.	Alewives, salted, brls.	Alewives, fresh or smoked, lb.	Caviare, lb.	Mixed and coarse fish, brls.	Total value.
1	King's.....	20,000	.....	20,000	250	20,000	15,000	9,650	20	150	5,000	1,000	75	\$ 15,422
2	Queen's.....	.....	100	5,000	.....	33,000	37,600	.....	.....	830	31,000	.....	50	12,545
3	Sunbury.....	.....	.....	1,000	.....	35,000	2,500	.....	.....	1,200	4,000	.....	100	8,570
4	York.....	.....	.....	46,000	.....	20,000	15,000	.....	.....	250	3,600	.....	265	21,092
5	Carleton.....	.....	.....	15,000	.....	.....	4,000	.....	10	.....	.....	.....	50	3,700
6	Victoria.....	.....	8,500	15,900	.....	500	.....	.....	15	.....	.....	.....	230	5,510
	Totals.....	20,000	8,600	102,900	250	108,500	74,200	9,650	45	2,440	43,600	1,000	770	66,839

6-7 EDWARD VII., A. 1907

RECAPITULATION OF DISTRICT No. 3, NEW BRUNSWICK.

Yield of fish, 1905.

Kinds of Fish.	Quantity.	Price.	Value.
		\$ cts.	\$ cts.
Salmon. Lb.	99,300	0 20	19,860 00
Shad, salted. Brls.	825	10 00	8,250 00
" fresh. Lb.	74,200	0 05	3,710 00
Herring, salted. Brls.	250	4 50	1,125 00
" fresh and smoked. Lb.	20,000	0 02	400 00
Whitefish. "	8,600	0 15	1,290 00
Trout. "	102,900	0 10	10,290 00
Bass. "	250	0 10	25 00
Pickarel. "	108,500	0 07	7,595 00
Alewives, salted. Brls.	2,440	4 00	9,760 00
" fresh and smoked. Lb.	43,600	0 02	872 00
Sturgeon. "	9,650	0 08	772 00
" caviare. "	1,000	0 90	900 00
Eels. Brls.	45	10 00	450 00
Coarse and mixed fish. "	770	2 00	1,540 00
Total.			66,839 00

RECAPITULATION of Capital invested in fisheries, 1905.—District No. 3.

Materials.	Number.	Value.
		\$
Men employed fishing.	1,598	
Vessels (tonnage 40).	2	2,000
Boats.	956	10,525
Gill-nets (fathoms)	55,800	25,900
Rods and lines.	1,920	5,013
Eel traps.	50	50
Cottages, smoke houses, ice houses and freezers.	207	11,860
Total.		55,348

SESSIONAL PAPER No. 22

RECAPITULATION showing the Number, Tonnage and Value of Vessels, Boats, Nets and of all Fishing Materials and other Fixtures used in the Fishing Industry of the whole Province of New Brunswick, for the Year 1905.

COUNTIES.		FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.									
		Vessels.			Boats.			Gill-nets.			Seines.		Trawls.				
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.	
<i>District No. 1.</i>																	
1	Charlotte.	19	338	7900	91	442	40790	682	1437	104975	16850	41	2300	2800	236	2935	
2	St. John	97	2485	57100	365	1195	60240	1122	1428	43050	15600	436	13865	27700	643	5570	
<i>District No. 2.</i>																	
3	Albert.					15	500	25	20	2500	1500						
4	Westmorland.					1180	33200	1898	2110	72000	28500						
5	Kent.					1185	32275	1845	8400	158600	37000						
6	Northumberland.					705	22500	1850	8200	179000	15800				14	260	
7	Gloucester.	8	124	3500	26	1700	54000	3530	7800	237500	117000				375	1700	
8	Restigouche.	221	2630	98000	842	222	4540	495	160	26800	22500						
<i>District No. 3.</i>																	
9	Victoria.					300	2045	455	16	200	160						
10	Carleton.					45	450	100	30	1000	500						
11	York.					185	2000	350	385	12000	6120						
12	Sunbury.					58	580	100	500	10375	4000						
13	Queen's.	2	40	2000	8	268	2950	360	712	17225	7120						
14	King's.					100	2500	225	500	15000	8000						
Totals.		348	5643	167300	1336	7600	258570	12937	25698	880225	422850	477	16165	30500	1270	10465	

RECAPITULATION showing the Number, Tonnage and Value of Vessels, Boats and other Fishing Materials, &c.,
New Brunswick—Continued.

COUNTIES.	FISHING GEAR OR MATERIALS.				LOBSTER PLANT.				OTHER FIXTURES USED IN FISHERIES.											
	Weirs.		Smelt-nets.		Hand Lines.		Canneries.		Traps.		Persons employed in canneries.		Freezers and Icehouses.		Smoke and Fishhouses.		Piers and Wharfs.		Tugs, Steamers & Smacks.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Value.	Persons employed in canneries.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
<i>District No. 1.</i>																				
1 Charlotte	34	10800	105	78	...	...	...	...	6476	6871	...	...	8	3600	71	21800	79	13000	...	...
2 St. John	363	201900	36	340	2103	1607	4	8500	19450	19450	86	...	8	2200	676	157600	231	85000	113	21300
<i>District No. 2.</i>																				
3 Albert	285	11500	275	110	68	15500	75000	67000	1750	...	70	5600	180	14700	14	2500	4	4000
4 Westmorland	706	28500	1050	380	46	18100	41500	38200	805	...	16	9100	26	2900	15	4000	5	3000
5 Kent	943	75000	300	420	12	9000	15000	13000	300	...	44	20200	117	11700	1	10000	18	6000
6 Northumberland	300	12000	4100	3200	65	56500	105000	96000	2100	...	54	19200	108	15500	18	13000	43	6500
7 Gloucester	168	9400	50	5	3	3000	6650	6050	92	...	8	16500	2	800	1	200	4	4000
8 Restigouche
<i>District No. 3.</i>																				
9 Victoria	610	†1600	...	...	...	...	...	...	...	...	...	...	12	3300	...	...	...	9
10 Carleton	325	700	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
11 York	385	1500	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
12 Sunbury	100	200	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
13 Queen's	250	500	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13
14 King's	250	500	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14
Totals	297	212700	2438	136740	9903	10800	198	110600	269276	246771	5133	268	76400	1389	236900	359	127800	183	44800	

† From No. 9 to 14, the lines also include rods.

SESSIONAL PAPER No. 22

RECAPITULATION showing the Kinds and Quantities of Fish and Fish Products in the Province of New Brunswick, for the Year 1905.

COUNTIES.	KINDS OF FISH.																				
	Salmon, fresh, lb.	Salmon, preserved in cans, lb.	Salmon, smoked, lb.	Herring, salted, brls.	Herring, fresh, lb.	Herring, smoked, lb.	Mackereel, fresh, lb.	Mackereel, salted, brls.	LoBSTERS, preserved in cans, lb.	LoBSTERS, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked 5-man haddies, lb.	Hake, dried, cwt.	Hake sounds, lb.	Pollock, cwt.	Halibut, lb.	Number.	
<i>District No. 1.</i>																					
1 Charlotte	6000			7905	*768000	4565200			90240	9775	2724		978500	1375	63900	*20490	22150	21061	16360	1	
2 St. John	325110			5						2385	792		150000	700		1620	1200	1520		2	
<i>District No. 2.</i>																					
3 Albert	3500			300	5000		6500			100										3	
4 Westmorland	6500			46400	570000	9660000			629000	1700	100									4	
5 Kent	65000	400 2000		23700	810000		163800	200	437600	2750	1570			140		2260	1600		4000	5	
6 Northumberland	505000		3500	16000	50000	22000	38200	10	187600	400	2920			750		1100	500		5800	6	
7 Gloucester	420000	3600 2000		80000	480000	30000	60000	70	877000	1150	69000	290		1000		5400	6400		106000	7	
8 Restigouche	167270	300		1500	240000	40000			28000	260	40									8	
<i>District No. 3.</i>																					
9 Victoria	10000																			9	
10 Carleton	8000																			10	
11 York	58500																			11	
12 Sunbury	800																			12	
13 Queen's	2000																			13	
14 King's	20000			250		20000														14	
Totals ..	1597680	4300 7500		176120	2923000	14337200	268500	280	2249440	18520	77146	290	1128500	3965	63900	30910	31850	22581		132160	

* Several items not enumerated here. See County returns or Recapitulation, page 138.

RECAPITULATION showing the Kinds and Quantities of Fish and Fish Products in the Province of New Brunswick, for the Year 1905.

COUNTIES.	KINDS OF FISH.										FISH PRODUCTS.				TOTAL VALUE OF ALL FISH.	Number.				
	Trout, lb.	Shad, brls.	Smelts, lb.	Alewives or Caspereau, brls.	Bass, lb.	Pickarel, lb.	Eels, brls.	Sardines, brls.	Oysters, brls.	Clams, brls.	Flounders, lb.	Tom cod or frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.			Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.
																				cts.
<i>District No. 1.</i>																				
1 Charlotte	2000		35000	400							2600	200	85			33492	13753	1500		*1,396,069 10
2 St. John		875		11625			150	*332495								800	2300			186,333 50
<i>District No. 2.</i>																				
3 Albert.	11000	80	4000		600		60			10		25000			40					6,252 00
4 Westmorland	28500	1000	840000	800	8100		435		1200	5600		60000			100	46000	76000			774,410 00
5 Kent	9600	180	1548000	2300	20000		1000		3900	28350	52000	130000	17	3250	600	8700	24000	12		533,719 00
6 Northumberland.	38300	1470	3090000	1500	105000		940		8300	600	380000	1560000		2200	350	6040	30100	20		576,439 00
7 Gloucester.	28400	50	971500	100	20500		545		900	16000	71500	204000	755	3375	23000	26000	71000	84		1,240,145 00
8 Restigouche.	10300		200200		1000		56				32000	31000		80		410	600			66,884 00
<i>District No. 3.</i>																				
9 Victoria	15900						15													5,510 00
10 Carleton.	15000	40				500	10							230						3,709 00
11 York	46000	175		278										50						21,092 00
12 Sunbury	1000	78		1220		20000								265						8,570 00
13 Queen's.	5000	528		985		33000								100						12,543 00
14 King's.	20000	375		175	250	20000	20							75						+ 15,422 00
Totals	231000	4851	6188700	19383	155450	108500	3231	336496	14300	56532	538100	2010200	857	11175	58382	103203	203200	116		4,847,090 60

* Several items not enumerated here. See County returns or Recapitulation, page 138. + In line 14 add 8,690 lbs. of whitefish and 9,650 lbs. sturgeon.

SESSIONAL PAPER No. 22

RFCAPITULATION

Of the Yield and Value of the Fisheries of the whole Province of New Brunswick,
for the Year 1905.

Kinds of Fish.	Quantity.	Rate.	Value.	Total.
		\$ cts.	\$ cts.	\$ cts.
Salmon, fresh. Lb.	1,597,680	0 20	319,536 00	321,681 00
" canned. "	4,300	0 15	645 00	
" smoked. "	7,500	0 20	1,500 00	
Herring, salted. Brls.	176,120	4 50	792,540 00	1,145,394 00
" fresh. Lb.	2,923,000	0 01	29,230 00	
" smoked. "	14,337,200	0 02	286,744 00	
" kippered. "	368,800	0 10	36,880 00	
Mackerel, fresh. "	268,500	0 12	32,220 00	36,420 00
" salted. Brls.	280	15 00	4,200 00	
Lobsters, canned. Lb.	2,249,440	0 25	562,360 00	722,120 00
" fresh or alive. Cwt	18,520		159,760 00	
Cod, dried. "	77,146	4 50	347,157 00	365,657 00
" fresh. Lb.	390,000	0 04	15,600 00	
" tongues. Brls.	290	10 00	2,900 00	
Haddock, dried. Cwt.	3,965	3 00	11,895 00	49,584 00
" fresh. Lb.	1,128,500	0 03	33,855 00	
" finnan haddies. "	63,900	0 06	3,834 00	
Hake, dried. Cwt.	33,470	2 25	75,307 50	91,232 50
" sounds. Lb.	31,850	0 50	15,925 00	
Pollock. Cwt.	22,581	2 00		45,162 00
Halibut. Lb.	132,160	0 10		13,216 00
Trout. "	231,000	0 10		23,100 00
Shad. Brls.	4,851	10 00		48,510 00
Alewives. "	19,383	4 00		77,532 00
Eels. "	3,231	10 00		32,310 00
Smelts. Lb.	6,688,700	0 05		334,435 00
Bass. "	155,450	0 10		15,545 00
Whitefish. "	8,600	0 15		1,290 00
Pickarel. "	105,000	0 07		7,595 00
Sturgeon. "	9,650	0 08	772 00	
" caviare. "	1,000	0 90	900 00	
Flounders. "	538,100	0 03		16,143 00
Tom-cod. "	2,010,200	0 03		60,306 00
Sardines. Brls.	336,496	2 00	672,992 00	
" canned. Cans.	3,672,000	0 05	183,600 00	
Squid. Brls.	857	4 00		856,592 00
Oysters. "	14,300	5 00		3,428 00
Clams and quahaugs. "	56,532		157,652 00	71,500 00
" canned. Cans.	383,200	0 10	38,320 00	
Scallops. Brls. and cans.				195,972 00
Cockles. Brls.	360	5 00		5,280 00
Coarse fish. "	11,175	2 00		1,800 00
Fish as bait. "	103,203	1 50		22,350 00
" as fertilizer. "	203,260	0 50		154,804 50
" oil. Galls.	58,382	0 30		101,630 00
Seal skins. No.	116	1 25		17,514 60
Dulse. Lb.	119,500	0 06		145 00
Total for 1905.				7,170 00
" 1904.				4,847,090 60
Increase.				4,671,084 30
				176,006 30

RECAPITULATION

OF the Number of Fishing Crafts, Nets, &c., in the whole Province of **New Brunswick**, for the Year 1905.

Articles.	Value.	Total.
	\$	\$
348 fishing vessels (5,643 tons)	167,300	
7,600 " boats.....	258,570	
880,225 fathoms of gill-nets	422,850	
16,165 " seines.....	30,500	
2,438 smelt-nets.....	136,740	
174 bass-nets.....	1,060	
397 weirs.....	212,700	
1,270 trawls	10,465	
9,903 hand lines and rods.....	10,813	
50 small eel-traps	50	
		1,251,048
198 lobster canneries.....	110,600	
269,275 " traps and fixtures.....	246,711	
		357,371
208 fish freezers and ice houses.....	76,400	
1,389 smoke and fish houses	236,990	
359 fishing piers and wharfs.....	127,800	
183 " tugs and smacks.....	44,800	
853 smelt fishing shanties	13,800	
5 sardine canneries.....	41,000	
5 clam canneries.....	6,500	
5 fish curing factories.....	10,000	
40 fish presses.....	600	
1 fish guano factory	5,000	
166 pile drivers.....	4,300	
154 weir scows.....	6,540	
		573,640
Total.....		2,182,059

STATEMENT of the number of men engaged in the Fisheries of **New Brunswick**, 1905.

Number of men in vessels.....	1,336
" " boats.....	12,937
" persons in lobster canneries.....	5,133
Total	19,406

SESSIONAL PAPER No. 22

APPENDIX No. 10.

NOVA SCOTIA.

District No. 1—Comprising the four counties of the Island of Cape Breton.

Inspector A. C. Bertram, North Sydney.

District No. 2—Comprising the counties of Cumberland, Colchester, Pictou Antigonish, Guysborough, Halifax and Hants.

Inspector, Robert Hockin, Pictou.

District No. 3—Comprising the counties of King's, Annapolis, Digby, Yarmouth, Shelburne, Queen's and Lunenburg.

Inspector A. C. Robertson, Barrington Passage.

DISTRICT No. 1.

NORTH SYDNEY, C.B., April 16, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit my annual report of the fisheries for the year 1905, for District No. 1, comprising the four counties of the Island of Cape Breton. Herewith I inclose, with report, the statistics, giving the products of the fishery for the year in kinds, quantities and values, together with value of plant and material employed.

I am pleased to report that there is a very marked increase for the year in the total value of the fishery, over that of 1904, of \$174,078. This increase is made up in the general yields of all kinds: the leading commercial branches as compared with the previous yield in value as follows:—

	1904.	1905.	Increase.
Mackerel.....	\$206,268	\$318,174	\$111,906
Lobsters.....	313,095	369,101	56,005
Herring.....	86,745	122,849	36,104
Haddock.....	80,175	97,929	17,754
Salmon.....	27,226	28,840	1,614

In order to see at a glance the result of the season's operations by counties, I submit the following compiled statement:—

County	1904.	1905.	Increase.	Decrease.
Cape Breton.....	\$270,254	\$341,314	\$71,060	
Inverness.....	222,385	313,557	91,172	
Richmond.....	493,585	526,196	32,611	
Victoria.....	178,577	157,811	.....	\$20,766
	<hr/> 1,164,802	<hr/> 1,338,878	<hr/> 194,843	
			<hr/> 20,766	

Increase... ..174,077

6-7 EDWARD VII., A. 1907

It will thus be seen that the season's operations have been successful. Of course the increased price of commercial fish has materially helped to swell the total values.

In the whole district the statistics show there were 109 fishing vessels employed against 111 and 634 men employed against 624 men of the previous year. The value of those vessels engaged in 1905 was \$45,480, against a value of \$41,975, in 1904. The boats used last season numbered 2,939, against 2,734 in the previous year, and the number of men employed was 5,237, against 4,866 men in 1904. The value of the boats employed last year was \$64,215, against the value of \$55,084. Thus while boat fishing increased by over 200, the vessels decreased by 2. There were 5,866 men engaged in the deep sea fishing last year against 5,490 in 1904. The total value of material used last year in the fishery was \$572,165, against \$498,268, during the previous season.

With the increase of trap-nets and bait freezers, the fishermen are not likely to be handicapped in future years by scarcity of bait. Last year seven trap-nets were set, an increase of three over the previous year, and 37 freezers and ice-houses last year, an increase of three over the previous year. The trap-nets employed next season will more than double those employed in 1905, with an increase of half a dozen freezers and ice-houses. The fishermen, therefore, are not likely to have so many weeks of enforced idleness as a result of 'no bait.'

Adverting to the employment of trap-nets, I may here state that on the northern coast of Victoria county during the first part of the season the quantities of haddock taken in two traps could only be handled with difficulty, so great was the catch. It is this evidence of immense school of haddock on that coast in the early season that has caused so many of the fishermen to apply for trap-net licenses for the approaching season. The owners of one of the trap-nets, through inexperience, allowed their fish to become damaged and unsaleable and lost money. There is no establishment yet started on the northern coast for the converting of haddock into the cured article, known as 'smoked finnan haddies.' From the immense quantities that can be taken, there is little doubt that an establishment for the curing of those excellent food fish would pay investors handsomely. South Ingonish should be a very suitable place for such an establishment.

As year follows year there is no evidence of decrease in any kind of fish, either in deep-sea or river. Of course seasons bring forth failures in the fisheries, but these failures can be traced to weather conditions, scarcity of bait, or ravages of the dogfish pest. Before the arrival of dogfish during the last days of June, deep-sea fishing is good, but as soon as they make their appearance on the numerous banks which surround this island, food fish, particularly the cod family, disappear, dogfish taking possession of the various banks. In the autumn months, when mackerel take their departure for southern waters, dogfish also disappear. Thus they follow the mackerel schools from southern haunts and depart from our northern waters when mackerel take their departure in autumn.

I have in former reports referred to the dogfish pest. In this report I have nothing further to add. I do not think their numbers have increased during the past three years. Yet, with the exception of those taken by local fishermen for fertilizing purposes, and the few taken by some lobster packers for experimental canning, there has been nothing done in my district to exterminate them. That they are a great menace to the prosecution of deep sea fishing, there is abundance of evidence. That dogfish are the cause of the absence, during the past twelve years, of midsummer herring which previously made their appearance in large schools in our bays and harbours as regularly as the midsummer months came around, is beyond doubt. Those fish were the best of the herring family that visited our coast, and were considered equal in size and flavour to the No. 1 Labrador herring of years ago. Their absence, therefore, has been a distinct loss, not only to the average fisherman, but to the average farmer, who always had his gill-net ready for their appearance, and besides his supply of herring was able to realize many dollars for sale of his surplus.

With our fishermen fishing is pursued in a perfunctory way, as most of them have small farms which they cultivate, thus dividing the two occupations. That there is enough wealth in the sea for more energy and capital, all must admit. The

SESSIONAL PAPER No. 22

quantities of fish taken on the Cape Breton coast by the local fishermen is not more than thirty per cent of its catch. Vessels from the United States, from Western Nova Scotia, P. E. Island, Newfoundland, St. Pierre and Miquelon fish during the summer months around our Cape Breton coast, their enormous catches never entering into the annual fishery statistics of Cape Breton. The fish taken by United States fishermen not only enter into the consumption of that country, but fresh and cured are exported to the Western Canadian markets. This Canadian market should be supplied by our own fishermen, but our own maritime people do not seem to possess the enterprise which their southern neighbours display so abundantly. The natural advantages are theirs, but somehow they do not seem to take advantage of their favourable position. Now that Canadian fish exporters have lost the Cuban market, which to them was so important at one time, one would imagine that they would get back at the United States by taking from them the Canadian market, but so far no effort has apparently been made to reach out for new markets. Possibly an increase in the Canadian duty on foreign fish might give the fishermen of the maritime provinces a portion of the Ontario market.

Cape Breton's inland sea, known as the Bras d'Or lakes, is a great resort for cod and herring, which can be caught all seasons of the year. That the fish find abundance of food in those waters is evident from their fat condition. It is not unusual to catch cod weighing over sixty pounds in the Bras d'Or lakes. Those fish are in abundance and are caught through the ice in winter as well as in open water in the summer months. Herring, too, are abundant in certain parts of the great lakes, and supply the home market as well as large quantities disposed of for bait purposes to vessels and lobster packers. No doubt with proper transportation and refrigerator cars, those fish could be disposed of with profit in the upper province markets. Here again enterprise is conspicuous by its absence.

The Inverness salmon rivers were well supplied during the summer with salmon, and not for years was there such excellent angling in the Margaree river. The visitors from abroad to the Margaree river were delighted with this sport, and no doubt there will be an increased number of them from the United States and the upper provinces next summer. The result of the angling in the salmon and trout rivers last summer shows that water conditions have all to do with those fish entering the upper waters, as the rivers were well watered last summer. During low water in the rivers salmon and trout will not attempt to reach the fresh water pools,

All the other kinds of river fish were plentiful during the season, with the exception of alewives which, for some reason unknown, did not make their appearance in such large schools as in former years.

I have the honour to be, sir,

Your obedient servant,

A. C. BERTRAM,

Inspector of Fisheries.

6-7 EDWARD VII., A. 1907

DISTRICT No. 2.

ANNUAL REPORT OF THE FISHERIES OF DISTRICT No. 2, NOVA
SCOTIA COMPRISING THE COUNTIES OF ANTIGONISH,
COLCHESTER, CUMBERLAND, GUYSBOROUGH,
HALIFAX, HANTS AND PICTOU.

Pictou, January 31, 1906.

To the Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit my annual report of the fisheries of District No. 2, Nova Scotia, together with tabulated returns showing the increase or decrease of each kind of fish.

The estimated value of all the fish taken during the past season is \$2,441,155 which is about 32 per cent more than the estimated value of the catch for last year, and about 35 per cent above the average catch for the past 16 years; however, there is about 10 per cent of this increase, attributable to the large quantity of dogfish which were taken and used for fertilizer at the reduction works at Canso and rated as such.

Of the anadromous fishes the report shows an increase of about 7 per cent in the catch of salmon, a decrease of about 50 per cent in the catch of shad, a decrease of about 20 per cent in the catch of smelts, a decrease of about 8 per cent in the catch of alewives of the deep-sea fishes.

Codfish, there is a decrease of about 9 per cent; haddock, there is an increase of about 7 per cent; pollock, an increase of about 200 per cent; halibut, an increase of 400 per cent. Comparing the catch of the whole cod family including cod, haddock, hake and pollock, there is an increase of 23 per cent.

SALMON.

On the Atlantic coast of the counties of Halifax and Guysboro' there was an increase of about 50 per cent in the catch of these fish over that of last year, while on the Straits of Northumberland there was a decrease of about 10 per cent and in the Bay of Fundy counties a decrease of about 16 per cent.

The past season has been a most unfavourable one for the future of this fishery, owing to the condition of the rivers during the time the salmon usually ascend for spawning. So far as I can learn from residents near the rivers, the water has not been so low for forty years in the autumn months, the result being that the fish did not ascend until they were well advanced in the gravid state and comparatively helpless while the shallow water exposed them to the onslaught of poachers, and made their protection by the limited number of guardians a matter of great difficulty.

Some of the guardians did excellent work, however, and through the efforts of Guardians William Livingstone and Johnston Cameron in Pictou county, eight persons were summoned and seven convicted.

SHAD.

Last year I reported that the catch was the smallest since the year 1890. This year I have to report that there is a decrease in this season's results of 50 per cent from that of last year, the catch of the several years being as follows:

SESSIONAL PAPER No. 22

	Barrels of shad taken.
1890.....	756
1891.....	1,178
1892.....	1,811
1893.....	1,346
1894.....	981
1895.....	1,208
1896.....	1,090
1897.....	1,382
1898.....	2,777
1899.....	3,208
1900.....	1,375
1901.....	749
1902.....	948
1903.....	2,115
1904.....	644
1905.....	333

Overseer Davison, of Colchester county, says regarding this fishery : I know for a certainty that the month of May is the spawning season, and the Shubenacadie and Stewiacke rivers are the two rivers in which our shad deposit their spawn.

In former years he has had to report as many as 5,000 barrels exported from his division. Then the fishermen commenced operations about June 10, and the shad caught were very fat; so fat indeed that in frying them in a pan not only was it unnecessary to add any fat for cooking but there would be a surplus left in the pan. Occasionally a chance one which was not fat was taken and these are supposed to have come from the spawning grounds. He again urges the protection of the fish while in the rivers for spawning.

Overseer Campbell, of Cumberland, says that shad which used to be plentiful are now almost extinct.

Overseer James R. Mosher says that in his report four years ago, he had stated that if the shad were not protected, they would become extinct, and it has about come true for there were only 5 barrels taken last year, as compared with 750 in 1899, and that was only about one third of the quantity which used to be caught each season about 1875. He advocates a close time for five years and protection of the fish in the spawning waters.

ALEWIVES OR GASPÉREAU.

The catch is the smallest during the past seventeen years and is about 9 per cent less than last year. On the Atlantic coast Overseer Rowlings reports them as very scarce and only about 5 per cent of what would be caught a few years ago were taken, nor can he account for this as there are several rivers with lakes for spawning to which they have access without molestation.

HERRING.

The catch was about 28 per cent greater than last year and a little more than the average catch of the past sixteen years.

MACKEREL.

Schools of spring mackerel first made their appearance about May 15, and good catches were taken in Guysboro county. The total catch for the district shows an increase over last year of about 40 per cent and more than an average of the past sixteen years by about 20 per cent.

6-7 EDWARD VII., A. 1907

HALIBUT.

The return shows the largest catch of these fish for sixteen years and is about 75 per cent larger than that of last year.

LOBSTERS.

The quantity canned in the district was about $2\frac{1}{2}$ per cent less than last year, while the quantity exported fresh in shell was about 100 per cent more. Had this excess of fresh lobster been canned, it would have resulted in an increase of 7 per cent over the catch of last year.

It is to be noted that on the Atlantic coast and in the Straits of Northumberland the increase is nearly the same.

FISHWAYS.

During the past season fishways have been built in the two dams on the River Herbert in Hants county and one in Guysboro county on a tributary of the St. Mary's river.

Fishways are recommended to be built in a dam at Aspen on the St. Mary's river by Overseer D. Reid, of Guysboro, and A.R. McAdams, of Antigonish; on a dam on the Lawrencetown river by Overseer George Rowlings, of Halifax; on dams on the Walton, Meander and St. Croix rivers by Overseer Jas. R. Mosher; on two dams on the River John, in Pictou county, by Overseer James Kitchin.

During the year forty-one persons have been convicted of violations of the Fisheries Act, and fines ranging from \$1 to \$100 imposed. A number of these convictions have been on view of the offence by the local officers, the others in the Inspector's Court.

For the first time since lobster canneries were licensed there was a reported violation in Cumberland county by licensed canners packing longer than the law allows; they were convicted on view and fined \$100 each.

I have the honour to be, sir,

Your obedient servant

ROBERT HOCKIN,

Inspector of Fisheries.

SESSIONAL PAPER No. 22

DISTRICT No. 3.

ANNUAL REPORT ON THE FISHERIES OF DISTRICT No. 3, COMPRISING
THE COUNTIES OF LUNENBURG, QUEEN'S, SHELBURNE, YAR-
MOUTH, DIGBY, ANNAPOLIS AND KING'S.

BARRINGTON PASSAGE, N.S., May 2, 1906.

To the Dominion Commissioner of Fisheries, Ottawa.

SIR,—I have the honour to submit my annual report upon the fisheries of this part of the province, with the statistical tables showing the catch of fish and its value in the seven counties forming the said district.

The whole yield, as compiled from the returns of the different fishery officers, is valued at about four and a half million dollars, more than the value of the other two districts of Nova Scotia together. This amount exceeds the previous yield by over \$135,000.

The following statement gives the relative importance of the different counties of my division, showing which have prospered or the contrary :

Counties,	1905.	1904.	Increase.	Decrease.
	\$	\$	\$	\$
Digby.....	1,314,057	1,242,407	71,650	.....
Shelburne.....	1,173,501	941,173	232,328	.....
Lunenburg.....	869,833	984,745	.....	114,912
Yarmouth.....	712,625	871,179	.....	158,554
Annapolis.....	182,810	93,274	89,536	.....
King's.....	123,401	94,414	28,987	.....
Queen's.....	122,824	136,824	.....	14,000

REMARKS.

Of the four large producing counties, Shelburne makes the best showing with its surplus of nearly a quarter of a million dollars. This is attributed to the large capture of lobsters. Over three million pounds of live lobsters are reported as shipped, mostly to U. S. markets, from this county alone, being an increase of nearly nineteen thousand cwts. over the production of 1904. Line fish, as haddock and hake, also contributed very much to the surplus yield of Shelburne. Of the three smaller counties, Annapolis has almost doubled the catch of 1904. This large increase is also attributed mainly to the deep water species, as cod, haddock and hake, which were abundant in that locality.

Lunenburg, with its large fishing fleet, shows a falling off, ascribed chiefly to the shortage of cod and mackerel, proving that the bank fisheries were not proportionally remunerative to the shore fishing.

In Yarmouth, the decline is more apparent than real, as in former years the port of Yarmouth had the credit of all live lobsters shipped therefrom, while perhaps 40 per cent were captured in the neighbouring waters of Digby and Shelburne. This year this has been corrected. There seems to be also a large falling off in the catch of herring.

6-7 EDWARD VII., A. 1907

LINE FISH.

However, taken as a whole, the line fisheries of my district more than hold their own; in fact, haddock, hake and pollock all show fair improvement.

LOBSTERS.

Fewer lobsters were preserved in cans, but more were shipped fresh, bringing the total value to about the same as that of the previous season. The prices obtained for these live crustaceans are much higher than the rates used in the compilation for the statistics. Digby, Yarmouth and Shelburne being in close proximity to the Boston market, benefit the most by the remunerative prices now realized for live lobsters.

Herring yielded about the same as in 1904, but mackerel declined considerably, hardly more than half the previous value being realized.

CAPITAL INVESTED, ETC. *

Nearly fourteen thousand persons found employment in the fishing industry of my district, about fifteen hundred of which work in the sixty-one lobster canneries dispersed over our sea coast.

The fishing crafts of this division are valued at \$1,198,000, the gill nets, seines and other fishing implements represent \$421,000 more. While \$187,900 is invested in our lobster plant, the fish freezers, smoke houses and other fixtures in the fishing industry represent nearly another half million dollars.

I have the honour to be, sir,

Your obedient servant,

A. C. ROBERTSON,

Inspector of Fisheries.

APPENDIX 10—*Continued.*

FISHERY STATISTICS

NOVA SCOTIA

District	No. 1.
"	No. 2.
"	No. 3.

NOVA SCOTIA, DISTRICT NO. 1.
ISLAND OF CAPE BRETON.

RETURN showing the Number and Value of Vessels, Boats, Nets, &c., also the Kinds of Fish Caught in the County of Richmond, Province of Nova Scotia, for the Year 1905.

DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR AND MATERIAL.				LOBSTER PLANT.		KINDS OF FISH.									
	Vessels.			Boats.			Gill nets.				Trawls.	Canneries.	Salmon, fresh, lb.	Salmon, preserved in cans, lb.	Salmon, smoked, lb.	Herring, salted, brls.	Herring, fresh, lb.	Mackerel, fresh, lb.	Mackerel, salted, brls.	Lobsters, preserved in cans, lb.	Number.	
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Value.										
<i>Richmond Co.</i>																						
1	5	137	3000	24	93	860	106	1250	24500	4800	28	140	500	.....	.....	1010	.....	.....	975	.....	1
2	3	96	1550	18	73	730	87	870	17400	3350	22	110	.....	.....	450	.....	.....	950	.....	2	
3	18	500	10800	136	45	390	52	420	8400	1610	14	80	.....	.....	16	.....	.....	175	15120	3	
4	16	278	6200	87	106	1200	145	690	13800	3450	165	825	750	.....	.....	1480	7000	127000	55	38400	4
5	2	38	750	8	168	1650	219	545	10900	2750	215	1075	2	900	.....	1200	5100	83400	445	28800	5
6	1	1	19	300	7	59	730	97	325	6500	1650	45	225	1	300	437	3800	32400	160	8500	6
7	4	174	2100	47	29	400	38	200	4000	1150	20	100	.....	.....	.....	272	2700	10000	330	.....	7
8	1	22	400	5	28	380	70	100	2000	500	4	40	.....	.....	.....	130	19000	16200	80	9120	8
9	2	36	480	10	55	800	135	200	4000	1400	29	300	1	3000	.....	350	10000	20000	900	22500	9
10	7	130	4600	42	265	9650	570	3600	72000	38000	68	680	1000	.....	1400	650	29000	25000	6250	.....	10
11	1	22	700	6	47	900	94	400	8000	2000	31	170	1	1000	325	1000	1200	2700	700	22730	11	
12	.....	.....	.....	.....	27	420	86	160	3200	800	11	55	1	1000	120	45	1350	1000	225	28848	12
13	.....	.....	.....	.....	30	600	82	96	1920	480	23	115	.....	.....	.....	40	1900	.....	150	.....	13
14	1	18	600	4	38	2900	105	200	4000	2000	20	100	1	2000	75	60	1500	1000	140	63500	14	
15	.....	.....	.....	.....	60	250	85	80	1600	280	29	205	.....	.....	.....	210	42000	.....	.....	.....	15
Irish Cove to Lynch River including Bar Head and Red Island																						
Total	61	1470	31480	394	1123	21860	1971	9136	182220	64220	724	3320	11	11300	3250	6504	124550	318700	11535	237518	.....
Values	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	650	78	9268	1246	38244	173025	59380	.....

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Richmond, Province of Nova Scotia, for the Year 1905.

DISTRICTS.	KINDS OF FISH.																					TOTAL VALUE OF ALL FISH.	Number.	
	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked finnan haddies, lb.	Hake, dried, cwt.	Hake, Sound, lb.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Smelts, lb.	Allevies or Gas- pereau, brls.	Eels, brls.	Clams, brls.	Flounders, lb.	Tom-cod or frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.			
<i>Richmond Co.</i>																								
1 Casco to Port Richmond	708	1445	32	35000	1060	15	415	700	15	400	9000	400	10	35	25	24700	25000	250	250	40	50	21,809 50	1	
2 R. Inhabitants and vicinity	180	380	17	2900	110	55	200	35	12	1000	7800	20	42	35	20	68000	1000	5	40	80	90	18,212 75	2	
3 R. Bourgeois and vicinity	35	1379	10	2600	150	12	100	25	1350	4000	4400	38	42	25	32400	26000	445	1235	1440	150	25,292 00	3		
4 Arichat and Petit de Grat	220	3590	25	443200	1390	380	600	810	150	500	500	500		35	25	24700	25000	445	1235	770	60	86,028 00	4	
5 Cap Auguet to Port Royal, including Janvin Island	708	1445	32	35000	1060	15	415	700	15	400	9000	400	10	35	25	24700	25000	250	250	40	50	21,809 50	1	
6 Rocky Bay and vicinity	180	380	17	2900	110	55	200	35	12	1000	7800	20	42	35	20	68000	1000	5	40	80	90	18,212 75	2	
7 Desceuse to Martinique	35	1379	10	2600	150	12	100	25	1350	4000	4400	38	42	25	32400	26000	445	1235	1440	150	25,292 00	3		
8 Grand Greve and St. Peters		750	3	17000	90	15	6	115	460	700	4400	38	42	25	32400	26000	445	1235	1440	150	25,292 00	3		
9 Rockdale		5800	18	27000	2709	18	11	1100	2200	300	390	11	3	6000	5000	5000	2700	35	50	170	62	9,602 25	8	
10 L'Ardoise, lower and west		490	7	5800	140	27	11	100	1700	600	43	30	20	6500	900	80	325	5600	200	147	373 50	10		
11 Grand River & Pt. Michaud		160	450	6	4450	310	18	7	95	1900	650	45	27	2	8000	7000	43	102	350	55	16,848 00	12		
12 L'Archevêque & St. Esprit		350	5	2100	120	13	6	80	1700	395	15	22	8	6000	4700	6000	4700	22	48	250	160	6,922 75	13	
13 Francoise and vicinity		375	900	5	1000	100	7	200	4000	340	25	15	10	8000	6000	6000	6000	60	100	700	150	27,131 25	14	
14 Fourchu																								
15 Irish Cove to Lynch River, including Bar Head and Red Islands		510	6				15		1900		2400	25	67			2000	8000			400	23	5,461 25	15	
Totals	2168	20145	134	847250	7120	166000	698	962 3490	85	18660	4985	26550	716	416	188	301750	45900	1584	2719	12445	1477		5,461 25	15
Values \$	10840	90652	1340	25418	21360	9960	1503	481 6980		1866	499	1328	2864	4160	564	9052	1377	6336	5438	3734	2216		526,196 50	

* Add in Nos. 4 to 7, 417,000 pounds of fresh cod, \$12,510, also \$3,570 of dogfish.

RETURN showing the Number and Value of Vessels, Boats, Nets, &c., and the Quantity and Value of Fish in the County of Cape Breton, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						KINDS OF FISH.						Number.			
		Vessels.			Boats.			Gill-nets.			Trap nets.			Trawls.			Lobster canneries, Value.						
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Salmon, fresh, lb.	Salmon, smoked, lb.		Herring, salted, brls.	Herring, fresh, lb.	Mackereel, fresh, lb.	Mackereel, salted, brls.
Cape Breton Co.																							
1	Gabus Bay and vicinity.	3	51	1500	15	60	7250	130	330	6470	3230	..	..	..	..	..	..	5500	4500	550	..	..	320
2	Louisburg	..	..	..	45	45	1350	90	201	5025	2000	..	..	..	..	..	..	2000	..	120	..	1800	90
3	Big Lorraine and vicinity.	..	..	..	20	20	1500	40	200	5000	1990	..	..	..	..	..	..	800	1200	50	..	2000	56
4	Little Lorraine to Mira River, including Main-a-Dieu.	2	27	550	7	66	1110	134	484	14710	10675	..	..	..	..	..	..	2050	8365	670	400	255	135
5	Seatarie Island.	1	10	250	4	28	295	66	85	2550	1000	..	..	..	..	..	..	..	..	196	..	..	30
6	Port Morien.	12	240	3000	60	85	1200	150	300	6300	2700	..	..	..	..	..	..	3000	..	1800	30000	1500	25
7	Schooner Pond and Glace Bay.	2	36	600	10	32	550	64	125	1250	1250	..	..	..	..	..	..	..	..	3000	32000	2500	35
8	Lingan to Low Point and South Bar.	1	18	400	6	33	600	48	126	2655	1260	..	..	..	..	..	..	5800	..	2400	18000	3300	35
9	The Sydneys and vicinity.	..	..	..	56	56	575	90	190	875	980	..	..	..	..	..	..	..	350	3027	1000	1000	..
10	Little Bras d'Or and Little and Big Ponds.	2	38	475	10	30	450	62	126	3150	435	1	400	144	..	..	..	..	..	60	..	1600	..
11	Piper and Irish Coves, including East Bay and vicinity.	..	..	..	90	90	1030	145	150	300	1045	..	..	..	..	..	..	..	..	2660	23100	..	..
Totals		23	420	6775	112	545	15910	1119	2317	49660	26565	1	400	2005	3380	11	19750	14415	2000	14533	104500	14555	726
Values.		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2883	400	65399	1045	1747	10890

[illegible]

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity and Value of all Fish in the County of Victoria, Province of Nova Scotia, for the Year 1905.

DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.				LOBSTER PLANT.		KINDS OF FISH.								Number.	
	Vessels.			Boats.			Gill-nets.		Trawls.		Canneries.		Salmon, fresh, lb.	Salmon, preserved in cans, lb.	Salmon, smoked, lb.	Herring, salted, brls.	Herring, fresh, lb.	Mackerel, fresh, lb.	Mackerel, salted, brls.			
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Value.	Number.	Value.	Number.								Value.		
<i>Victoria County.</i>																						
1	Little Narrows, both sides					36	482	45	73	1587	371	14	34								1	
2	Baddeck District					38	606	36	77	2236	695	10	58	300			100	54500			2	
3	Boularderie					45	420	50	84	1845	460	18	90	15			184	32700	500		3	
4	Englishtown to Cape Dolphin					50	455	58	122	3528	1065	30	158	4020			220	124400	100		4	
5	North, Little and French Rivers and vicinity.					107	1000	120	285	7143	1940	38	156	5275	860		350	57600	950		5	
6	Wreck Cove to Smoky Head					18	198	26	53	1394	419	9	69	2	650		45	3500			6	
7	South Bay to Ingonish					75	1750	153	190	4280	1330	52	364	3000			25				7	
8	Middle Head and N. Bay					129	1925	256	385	9625	2635	120	840	7000			1000	24000	100		8	
9	Neals Hr., Green Cove and New Haven					54	1860	98	138	2760	1380	28	536	4	780						9	
10	Dingwell to White Point.					47	800	94	143	5840	2440	20	100	2	860			240			10	
11	Sparling Brook to Mooney Point.					14	140	28	32	1180	540	1	400	1	500			37			11	
12	Bay St. Lawrence and vicinity					33	565	83	88	2070	1250	14	198	1	500			12			12	
Totals.....		1	11	125	4	646	10201	1047	1670	43488	14585	353	2601	12	3680	30510	1760	1000	1418	236700	2550	85
Values.....															6102	264	200	6381	2967	306	1275	

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Victoria, Province of Nova Scotia, for the Year 1905.

DISTRICTS.	KINDS OF FISH AND FISH PRODUCTS.														TOTAL VALUE OF ALL FISH.	Number.				
	Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Smelts, lb.	Eels, brls.	Oysters, brls.	Tom-cod or frost fish, lb.			Squid, brls.	Course and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Sealskins, No.
<i>Victoria County.</i>																				
1 Little Narrows, both sides.....		6	330		1000		3	2		2250	4000	50	195	1500		15	64	18	4,316	20
2 Baddeck District.....		1361	203			17	5	40	1150	250	350	25		1100		13	25	30	1,989	75
3 Boularderie.....		754	200		150	50	25	210	250	500	9	12			2	23	108	125	9,630	15
4 Englishtown to Cape Dolphin.....		1555	140		200	40	10	75	325	50	2650	26				52	232	105	8,834	35
5 North, Little and French Rivers and vicinity.....	28660	385	68		200	15	10	10	125	450	2650	26				25	37	55	20,269	0
6 Wreck Cove to Smoky Head.....	18670		4400		120	1200		1200	60							25	37	55	8,079	60
7 South Bay and Ingomish.....			2225		120	1200		1200											7	1
8 Middle Head and N. Bay.....			2225		1313				75	1000						58	1400	80	27,468	0
9 Neals Hr., Green Cove and New Haven.....	51490		2210	3	410		28	28	1000							58	1040	60	17,058	0
10 Dingwell to White Point.....	14300		470	2	110		315	315	13000							70	1490	280	25,468	0
11 Sparling Brook to Mooney Point.....	27360		38			11	53	53	3000							30	8100	50	12,975	0
12 Bay St. Lawrence and vicinity.....	22660		345			100	60	60	5300								470	15	7,850	0
Totals.....	163140	4061	10704	5	1470	3236	43	2070	24960	3475	9800	122	195	2600	248	153	13111	1041		24
Values.....	40785	20305	48108	50	44	9798	97	4140	2496	348	490	1120	975	78	992	306	3933	1562	157,811	15

* In this district add 750 tons of dogfish, \$4,500.

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Inverness, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	KINDS OF FISH.														TOTAL VALUE OF ALL FISH.	Number.									
		Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked fin- nan haddies, lb.	Hake, dried, cwt.	Hake sounds, lb.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Smelts, lb.	Alewives or Gaspereau, brls.			Eels, brls.	Oysters, brls.	Clams, brls.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	
Inverness Co.																										
1	Meat Cove to Fishing Cove. . . .	40380	565	565	...	...	...	165	80	25	1000	...	...	...	...	13	...	20	930	12	...	265	550	...	18,399 00	1
2	Eastern Harbour to Cape Rouge	48290	3175	3175	...	...	...	20	...	7	1000	...	...	...	...	40	...	30	45	50	455	1825	300	400	44,461 25	2
3	Cheticamp Point and Lake. . . .	25390	360	360	...	...	...	90	...	...	200	...	...	...	...	5	...	...	50	80	225	110	30	...	25,233 75	3
4	Margaree district including Island and River.	32375	1735	520	...	...	...	80	...	...	1200	500	...	...	20	...	...	...	50	100	500	100	100	...	11,538 00	4
5	Belle Cote.	1824	115	1310	3	...	...	10	...	...	1000	250	...	...	5	...	...	...	48	70	290	130	130	...	21,616 50	5
6	Doucett's and Delaney's Coves . .	14650	810	1165	2	...	...	10	...	5	1850	...	...	...	...	...	...	...	...	...	50	...	...	...	16,071 25	6
7	Sight Point to Mabou Harbour. . .	37825	1000	70	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	600	255	...	...	31,585 50	7
8	Port Hood to Seaside.	61872	1440	1440	...	...	...	125	...	...	...	200	1400	...	...	15	...	...	...	...	...	180	...	...	18,161 25	8
9	Judique to Low Point.	49920	260	260	...	...	...	...	...	...	...	3000	1600	...	...	30	...	...	1050	50	...	25	...	...	102,179 50	9
10	Port Hastings and Hawkesbury . .	...	550	550	...	...	...	...	...	...	3000	1800	...	...	...	62	300	...	...	...	260	...	650	...	12,675 50	10
11	West Bay to River Dennis. . . . .	...	935	935	...	...	...	...	...	...	...	150	...	...	...	15	...	...	...	...	...	...	...	...	12,075 50	11
12	Whycocomagh and Lake Anslie. . .	...	22	22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	914 00	12
	Totals.	312526	5660	10372	55	3300	1585	1000	2650	80	37	9250	4100	4800	75	342	300	50	2185	767	4190	1710	1310	...	...	313,567 75
	Values	\$ 78132	28300	46674	550	99	4775	60	5963	40	74	925	410	240	300	3420	1500	150	8740	1534	1257	2565	655	...	...

6-7 EDWARD VII., A. 1907

RECAPITULATION

Of the Yield and Value of the Fisheries of the **Island of Cape Breton**, for
the Year 1905.

Kinds of Fish.		Quantity.	Rate.	Value.	Total Value.
			\$ cts.	\$ cts.	\$ cts.
Salmon, fresh.....	Lb.	136,235	0 20	27,247 00	28,840 25
" preserved in cans.....	"	4,755	0 15	713 25	
" smoked.....	"	4,400	0 20	880 00	
Herring, salted.....	"	24,950	4 50	112,275 00	122,849 50
" fresh.....	"	1,057,450	0 01	10,574 50	
Mackerel, fresh.....	"	554,705	0 12	66,564 60	318,174 60
" salted.....	Brls.	16,774	15 00	251,610 00	
Lobsters, preserved in cans.....	Lb.	937,924	0 25	234,481 00	369,101 00
" fresh in shell.....	Cwt.	26,924	5 00	134,620 00	
Cod, dried.....	"	55,928	4 50	251,676 00	266,126 00
" fresh.....	Lb.	417,000	0 03	12,510 00	
" tongues and sounds.....	Brls.	194	10 00	1,940 00	
Haddock, dried.....	Cwt.	20,648	3 00	61,944 00	97,929 60
" fresh.....	Lb.	865,520	0 03	25,965 60	
" smoked finnan haddies.....	"	167,000	0 06	10,020 00	
Hake, dried.....	Cwt.	4,130	2 25	9,292 50	9,813 50
" sounds.....	Lb.	1,042	0 50	521 00	
Pollock.....	Cwt.	10,141	2 00	.....	20,282 00
Halibut.....	Lb.	63,850	0 10	.....	6,385 00
Trout.....	"	17,840	0 10	.....	1,784 00
Shad.....	Brls.	568	10 00	.....	5,680 00
Smelts.....	Lb.	111,280	0 05	.....	5,564 00
Alewives.....	Brls.	1,043	4 00	.....	4,172 00
Eels.....	"	1,155	10 00	.....	11,550 00
Oysters.....	"	530	5 00	.....	2,650 00
Clams.....	"	248	3 00	.....	744 00
Flounders.....	Lb.	308,850	0 03	.....	9,265 50
Tom-cod.....	"	54,400	0 03	.....	1,632 00
Squid.....	"	4,262	4 00	.....	17,048 00
Coarse and mixed fish.....	"	3,639	2 00	.....	7,278 00
Fish oil.....	Galls.	36,246	0 30	.....	10,873 80
Fish as bait.....	Brls.	8,255	1 50	.....	12,382 50
Fish as fertilizer.....	"	1,310	0 50	.....	655 00
Seal skins.....	No.	40	1 25	.....	50 00
Dogfish.....				.....	8,050 00
Total for 1905.....					1,338,880 25
" 1904.....					1,164,802 09
Increase.....					174,078 16

SESSIONAL PAPER No. 22

RECAPITULATION.

STATEMENT showing the Number and Value of Fishing Crafts, Nets, &c., in the **Island of Cape Breton**, for the Year 1905.

Articles.	Value.	Total.
	\$	\$
109 fishing vessels (2,233 tons) (634 men)	45,480	
2,939 fishing boats (5,237 men)	64,215	
14,583 gill-nets (316,973 fathoms)	122,310	
2 seines (170 fathoms)	550	
7 trap-nets	4,750	
3,595 trawls	13,461	
25 smelt-nets	475	
12,818 hand lines	15,801	
58 lobster canneries (2,371 persons employed)	44,485	267,042
136,914 " traps	91,020	
37 freezers and ice houses	17,265	135,505
1,484 smoke and fish houses	42,874	
451 piers and wharfs	91,079	
67 tug steamers and smacks	18,400	
		169,618
Total		572,165

NOVA SCOTIA, DISTRICT NO. 2.

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., also the Kinds of Fish, in the County of Cumberland, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISH OR MA.			R.		LOBSTER PLANT.		KINDS OF FISH.							Number.		
		Vessels.			Boats.			Gill-nets.			Canneries.	Value.	Number.	Salmon, fresh, lb.	Herring, salted, brls.	Herring, fresh, lb.	Herring, smoked, lb.	Mackerel, fresh, lb.	Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.			
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.													Value.	
											Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.			Value.
<i>Cumberland County.</i>																								
1	Pugwash, Gulf Shore and Malagash	1	14	250	2	83	2177	87	98	1960	483	28	23025	12	200	3900	348432	10	100	1				
2	Port Philip, Northport and Amherst Shore					105	2000	180	230	6800	2300	9	850	70	32000	185000	27504	130		2				
3	Wallace					10	124	10												3				
4	River Philip					12	150	12	15	300	100									4				
5	LaPlanche, Nappan and Maccan					20	400	25	10	200	100									5				
6	Minudie to Apple River	1	16	400	3	100	3000	140	300	8350	3600									6				
7	Advocate					20	500	50	50	1500	600									7				
8	Spencer's Island					15	300	25	20	600	200									8				
9	Port Greville					50	750	100	100	2200	1000									9				
10	Parrsboro' and Two Islands					30	350	50	50	1250	500									10				
	Totals	2	30	650	5	445	9751	679	873	23160	8883	37	23875	11500	1632	32000	185200	375936	405	850				
	Values															320	7434		2300	3704	468	93984	2835	3825

SESSIONAL PAPER No. 22

RETURNS showing the Kinds and Quantities of Fish and Fish Products in the County of, Cumberland, Province of, Nova Scotia,
for the Year 1905.

Number.	Districts.	KINDS OF FISH.																	TOTAL VALUE OF ALL FISH.	Number.		
		Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Shad, brls.	Smelts, lb.	Alewives or Gas- pereau, brls.	Bass, lb.	Eels, brls.	Oysters, brls.	Flounders, lb.	Tom cod or Frost fish, lb.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.			Fish as manure, brls.	Clams, brls.
<i>Cumberland County.</i>																						
1	Pugwash, Gulf Shore and Malagash.							16000					440					710	3600		94,019 00	1
2	Wallace							8500	101				116			26					1,461 00	2
3	Port Philip, Northport and Amherst Shore.							57000	75	1000	15	12	5	4500				3000	1500	35	21,126 00	3
4	River Philip.								5	500	15	5									615 60	4
5	LaPlanche, Nappan and Maccan.								50	500	5										500 00	5
6	Minudie to Apple River	1300	300	300	200	3000	1500	150	3000	60	1000							100	200	10	12,754 00	6
7	Advocate.	1000	100		400	1000	500			500			2000		2000	550	100	200	250	20	4,438 00	7
8	Spencer's Island.			50	50	1200	200		1000	20				1000	1000	100	100	150	10		2,972 50	8
9	Port Greville	1500	40		60	2500	150		1200	25								100	200	12	1,879 00	9
10	Parrsboro and Two Islands	1000			50	2 00	1000		1500	30	1000							200	150	100	2,610 00	10
	Totals.	4800	440	350	760	9700	4450	151	88200	366	4000	35	573	3000	4500	876	760	3710	6050	187	.....
	Values	144	1320	78	1520	970	445	1510	4410	1464	400	350	2865	150	225	1752	228	5565	3025	374	142,374 50	

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity and Value of all Fish in the County of Colchester, Province of Nova Scotia, for the Year 1905.

DISTRICTS.	FISHING BOATS.			FISHING GEAR OR MATERIALS.						LOBSTER PLANT.		KINDS OF FISH.					Number.	
	Boats.			Gill Nets.			Seines.			Canneries.		Salmon, fresh, lb.	Herring, fresh, lb.	Herring, smoked, lb.	Lobsters, preserved in cans, lb.	Cod, dried, cwt.		
	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.							
<i>Colchester Co.</i>																		
1 Sterling.....	26	780	26	.....	8400	2100	.....	2	1200	.....	3000	.....	.....	.....	36480	.....	1
2 Stewiacke.....	140	1350	260	280	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200	2
3 Five Islands.....	6	180	12	2	700	100	1	500	300	.....	3000	.....	.....	.....	.....	3	3
4 Economy.....	2	80	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	4
5 Little Bass River to Highland Village.....	10	400	20	10	3250	600	.....	.....	.....	.....	1800	.....	.....	.....	.....	.....	5
6 Great Village to Queen's Village.....	17	500	34	17	5200	1000	.....	.....	.....	.....	14050	.....	.....	.....	.....	.....	6
Totals.....	201	3290	356	309	17550	3800	1	500	300	2	1200	42930	1000	2000	36480	210		
Values.....												8586	10	40	9120	945		

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Colchester, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	KINDS OF FISH.															Total. VALUE OF ALL FISH.	Number.
		Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Shad, brls.	Smelts, lb.	Alewives or Gas- pereau, brls.	Bass, lb.	Oysters, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Clams, brls.		
Colchester Co.																		
1	Sterling.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10,905 00	1
2	Stewiacke.....	.....	.....	.....	.....	800	25	12000	180	3100	200	.....	.....	.....	370	.....	1,960 00	2
3	Five Islands.....	3000	20	10	5	3000	1100	.....	.....	.....	.....	160	25	.....	.....	300	2,798 00	3
4	Economy.....	300	.....	.....	.....	.....	9000	.....	.....	.....	.....	10	5	.....	.....	.....	1,384 50	4
5	Little Bass River to Highland Village.....	.....	.....	.....	.....	.....	600	.....	.....	300	.....	.....	.....	.....	.....	675	4,290 00	5
6	Great Village to Queen's Village.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,386 00	6
Totals.....		3300	20	10	5	3000	11500	49	12000	180	3400	200	170	30	370	975	.....	.....
Values.....		99	60	22	10	300	1150	490	600	720	340	1000	51	45	185	1950	25,723 50	.....

RETURN showing the Number of Fishing Vessels, Boats, Nets, &c., and the Quantity and Value of all Fish in the County of Pictou, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.				LOBSTER PLANT.		KINDS OF FISH.						Number.				
		Vessels.			Boats.			Gill-nets.		Trawls.		Canneries.		Herring, fresh, lb.	Mackerel, fresh, lb.	Lobsters, preserved in cans, lb.	Cod, dried, cwt.	Haddock, fresh, lb.						
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Value.	Number.	Value.	Number.						Value.					
<i>Pictou Co.</i>																								
1	West Pictou	2	114	5700	20	154	4620	158	130	4950	1078	30	300	14	12900	1400	125	8000	1400	281424	150	1500	1	
2	Pictou Island					95	2700	102	39	1200	320			3	11000		100	10000		171600			2	
3	Central Division					10	250	12	20	400	156												3	
4	Southern Division					27	400	30	48	2600	1100	16	60	1	300	16500		40000	400	14112	35	1500	4	
5	Merigonish Island					13	240	14	20	1200	645					5900		5000	300				5	
6	North Beach					13	100	13	25	800	420			2	1100	6000		4500	400	13104		300	6	
7	Ponds					12	150	14	30	1300	790			1	1200	5000		7000	600	32500		500	7	
8	Lismore					12	170	12	21	1700	650	5	25	1	300	3400		1600	200				500	8
	Totals	2	114	5700	20	336	8690	355	333	14150	5163	51	385	23	27600	37300	225	76100	3300	512740	190	3200		96
	Values															7460	1012	761	396	128185	8	5		

RETURN showing the Number, Tonnage and Value of Vessels and Boats and the Quantity and Value of all Fish in the County of Antigonish, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.				LOBSTER PLANT.		KINDS OF FISH.						Number.			
		Vessels.			Boats.			Gill Nets.		Trawls.		Can-neries.	Value.	Herring, salted, brls.	Herring, fresh, lb.	Mackerel, fresh, lb.	Mackerel, salted, brls.	Lobsters, preserved in cans, lb.	Cod, dried, cwt.				
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Number.	Value.	Number.	Value.												
<i>Antigonish County.</i>																							
1	Harbour Bouché, Linwood and Cape Jack.....	1	17	150	5	79	882	92	260	7103	1352	62	207	1	1000	3100	492	1500	2375	13	59120	144	1
2	Tracadie, Bayfield, Monk's Head and South Side Antigonish Harbour.....					49	1027	55	94	1920	631	23	87	1	800	28500	74	28200	1500	3	27072	71	2
3	North Side Antigonish Harbour, Lakeville and South Side Cape George.....					54	826	79	135	2811	1018	46	231	2	2400	11800	95	3200	1550	1	56496	256	3
4	North Side Cape George and Georgeville.....					18	255	30	45	846	240	20	112	1	800	1000	17	1500	900	2	13872	64	4
5	Malignant Cove, Doctor's Brook, Arisaig, Moidart and Knoidart					22	350	33	63	1260	322	20	100	1	1400	8700	20	1200	900	8	25824	58	5
Totals.....		1	17	150	5	222	8340	289	597	13940	3563	171	737	6	6400	53100	698	35500	7225	27	182384	593	
Values.....																10620	3141	356	867	405	45596	2668	

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Antigonish, Province of Nova Scotia, for the Year 1905.

Number.	Districts.	KINDS OF FISH.													TOTAL VALUE OF ALL FISH.	Number.								
		Haddock, fresh, lb.	Haddock, dried, cwt.	Hake dried, cwt.	Hake, sounds, lb.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Smelts, lb.	Alewives and Gas- pereau, brls.	Bass, lb.	Eels, brls.	Oysters, brls.	Clams, brls.			Flounders, lb.	Tom-cod or Frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	
<i>Antigonish County.</i>																	\$	cts.						
1	Harbour Bouché, Linwood and Cape Jack	600	27	71	110	23	150	....	250	1	1200	6	8	..	9434	....	59	474	316	830	600	22,063	75	1
2	Tracadie, Bayfield, Monk's Head and South Side Antigonish Harbour	1700	10	23	60	....	....	135	3300	6	2750	38	97	4	5600	350	1	15	72	204	270	15,934	85	2
3	North Side Antigonish Harbour, Lakeville and South Side Cape George	....	60	130	380	1	....	250	1000	....	....	7	....	....	8450	....	4	176	77	274	570	20,750	60	3
4	North Side Cape George and Georgeville	100	28	70	150	....	....	....	....	....	....	....	....	....	2200	....	1	70	76	153	140	5,081	30	4
5	Malignant Cove, Doctor's Brook, Arisaig, Moidart and Knoidart	6500	20	268	550	....	....	150	....	1	200	....	....	....	....	....	1	102	292	157	260	10,620	10	5
	Totals	8900	145	622	1250	24	150	535	4550	8	4150	51	105	4	25634	350	66	837	833	1618	1840	....	....	....
	Values	267	435	1349	625	48	15	54	227	32	415	510	525	8	1284	17	264	1674	250	2427	920	75,050	60	....

6-7 EDWARD VII., A. 1907

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, etc., in the County of Guysborough, Province of Nova Scotia, for the Year 1905.

DISTRICTS.				FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.												
Number.	Vessels.				Boats.				Gill-nets.				Seines.				Trap-nets.		Lobster Canneries No.	Number.
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.					
<i>Guysborough County.</i>																				
1	1	11	300	6	45	800	50	40	800	300	2	260	125					1	1	
2	1	11	250	6	52	1000	42	55	1000	325								2	2	
3	1	11	250	6	85	2000	85	100	2000	600	2	250	150					3	3	
4					27	600	26	35	760	300								4	4	
5					35	400	30	70	2000	800								5	5	
6					30	400	30	60	1600	450	2	200	120					6	6	
7	2	55	3500	20	50	800	40	85	1800	600								7	7	
8					16	300	18	25	500	200								8	8	
9	2	43	3000	14	70	1400	40	120	2400	700	1	150	150					9	9	
10					35	800	38	70	1400	420								10	10	
11					15	150	12	30	700	250								11	11	
12	2	43	1500	15	34	700	38	80	1600	500								12	12	
13					50	1500	45	150	3000	900	2	180	180					13	13	
14					35	1000	40	100	2000	600	1	100	50					14	14	
15					34	800	37	80	1600	500	1	100	50					15	15	
16	1	17	600	7	90	3200	109	550	11000	3000	2	150	100					16	16	
17	1	10	500	3	25	1250	31	250	5000	2500								17	17	
18	9	167	10000	46	84	6975	85	895	17900	8950								18	18	
19	3	32	1300	15	73	620	70	470	9400	4700								19	19	
20	2	23	1600	12	44	2045	38	446	8920	4460	1	100	200					20	20	
21	5	72	4000	26	108	5420	108	980	19600	9800	1	250	350					21	21	
22	7	93	5650	35	105	6190	100	785	15700	7850	2	280	450					22	22	
23	3	32	1600	13	51	2395	69	150	3000	1500	3	280	450					23	23	
24	20	364	21300	128	240	8600	280	1950	39000	19500	2	230	1900					24	24	
25					20	800	24	170	3100	1700								25	25	
26					50	2250	60	985	13700	9850	1	120	400					26	26	
27					35	1575	70	730	14500	7300								27	27	
28	1	29	1500	5	55	2200	65	645	12900	6450								28	28	

RETURNS showing the Number, Tonnage and Value of Vessels, Boats, Nets, etc., in the County of Guysborough Province of Nova Scotia, for the Year 1905.

DISTRICTS.	FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.								Lobs er canneries, No.	Number.
	Vessels.		Boats.		Gill Nets.		Seines.		Trap Nets.					
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Value.	Number.	Value.	Number.	Value.		

6-7 EDWARD VII., A. 1907

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Guysborough, Province of Nova Scotia, for the Year 1905.

DISTRICTS.		KINDS OF FISH.																
Number.		Salmon.		Herring.		Mackerel.		Lobsters.		Cod.		Haddock.		Hake.				
		Fresh, lb.	Preserved in cans, lb.	Salted, brls.	Fresh, lb.	Smoked, lb.	Fresh, lb.	Salted, brls.	Preserved in cans, lb.	Fresh in shell, cwt.	Dried, cwt.	Tongues and sounds, brls.	Fresh, lb.	Dried, cwt.	Smoked haddock, lb.	Dried, cwt.	Sounds, lb.	
1	Ecum Secum	650	.....	45	1000	.....	100	10	7104	71	200	2	400	10	.....	5	.....	10
2	Marie Joseph .....	.....	.....	50	800	.....	100	6	240	.....	275	1	300	8	.....	30	.....	1
3	Liscomb and Spanish Ship Bay	600	100	375	2000	.....	200	5	39824	260	450	3	500	25	.....	.....	.....	25
4	Gegogin	1800	200	80	600	.....	.....	.....	14736	.....	200	2	200	4	.....	2	.....	5
5	St. Mary's Bay and River	8700	500	120	700	.....	100	5	240	.....	25	.....	100	2	.....	.....	.....	5
6	Wine Harbour	600	200	250	1000	.....	.....	.....	.....	35	5	.....	300	5	.....	.....	.....	2
7	Port Hilford and Lake	4800	500	250	1500	.....	200	20	.....	180	1	7	200	20	.....	85	200	10
8	Holland Harbour and Indian River	200	.....	90	100	.....	.....	3	.....	25	.....	.....	100	3	.....	30	100	60
9	Port Beekerton	200	.....	375	1000	.....	300	45	22368	110	560	2	300	50	.....	10	.....	15
10	Fisherman's Harbour	200	.....	250	600	.....	200	60	20640	120	140	1	100	5	.....	.....	.....	10
11	Country Harbour	1000	.....	60	500	.....	500	.....	.....	30	.....	.....	4000	20	.....	.....	.....	11
12	Isaacs Harbour	1100	.....	150	1000	.....	600	35	27024	87	120	1	80000	90	.....	5	.....	75
13	Drum Head .....	.....	.....	225	1000	.....	2000	50	.....	500	3	.....	2500	20	.....	10	.....	300
14	Seal Harbour .....	.....	.....	120	400	.....	100	6	25824	160	275	1	2500	20	.....	3	.....	100
15	Cottles Harbour .....	.....	.....	75	400	.....	100	5	19584	24	230	1	300	3	.....	3	.....	100
16	New Harbour	300	.....	450	1000	.....	1600	100	11856	44	800	4	600	120	.....	38	100	550
17	Tor Bay .....	.....	.....	65	.....	.....	.....	53	1444	.....	613	.....	58	.....	.....	39	30	188
18	Larrys River .....	.....	.....	449	.....	.....	.....	349	.....	1261	.....	.....	388	.....	.....	14	20	388
19	Charles's Cove .....	.....	.....	330	.....	.....	.....	180	35712	44	1000	.....	299	.....	.....	50	100	573
20	Cole Harbour .....	.....	.....	235	.....	.....	.....	100	.....	680	15000	112	100	112	.....	102	100	170
21	Port Felix .....	.....	.....	584	.....	.....	.....	198	17088	10	1720	.....	8500	814	.....	118	170	671
22	White Head .....	.....	.....	60	2360	.....	18450	260	52860	389	2376	.....	47400	849	2900	466	560	1000
23	Raspberry and Dover .....	.....	.....	90	19100	.....	31650	200	61200	450	1354	.....	.....	650	.....	150	160	419
24	Canso and Canso Tittle	10000	2000	1000	464500	409000	857000	2137	81128	8734	7295	50	4275300	1420	610000	2200	12220	22475
25	Fox Island Main	1000	.....	58	1000	.....	8100	100	.....	240	.....	.....	4800	27	.....	5	.....	53

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Guysborough, Province of Nova Scotia, for the Year 1905.

DISTRICTS.	KINDS OF FISH.																	
	Salmon.		Herring.		Mackerel.		Lobster.		Cod.		Haddock.		Hake.					
	Fresh, lb.	Preserved in cans, lb.	Salted brls.	Fresh, lb.	Smoked, lb.	Fresh, lb.	Salted, brls.	Preserved in cans, lb.	Fresh in shell, cwt.	Dried, cwt.	Tongues and sounds, brls.	Fresh, lb.	Dried, cwt.	Smoked in man haddies, lb.	Dried, cwt.	Sounds, lb.	Pollock, cwt.	Number.
Guysborough Co.—Con.																		
26 Half Island Cove.....	1000		50	80000		18000	1300			1120	100000	240	336	5000	1000	240 26		
27 Philips Harbour.....			40	26200			360			468	3406	200	60		140	15 27		
28 Queensport.....	2000		200	60000		240000	1600	42624	42	950	200000	224	560	1500	500	2240 28		
29 Peas Brook.....			48	33000			375			246	1800	167	83	30	30	15 29		
30 Halfway Cove.....			80	74200			972			480	6000	200	162	80	36 30			
31 Sandy Cove and Cooks Cove.....	1770		88	96300			1154			278	1800	150	69	40	224 31			
32 Guysboro and Manchester.....	4500		50	12409		11400	600			580	6800	40	70	200	95 32			
33 Port Shoreham.....	1350		60	12200		4150	770			300		270	10		110 33			
34 St. Francis.....			80	13500		6800	575			173	14060	194	165	60	50 34			
35 Oyster Ponds.....			95	8600		4000	780			650	200		15		115 35			
36 Sand Point.....			75	2200		1600	245			176		90	40		36			
37 Steep Creek.....			370	11000		10000	900			95		40	170		20 37			
38 Mulgrave and Auds Cove.....			50	10200		29500	150			79	180000	25	25000		20	85 38		
Totals.....	41770	2000	3500	7659	893600	409000	1408750	13589	494500	26619	72	465300	6986	643500	5120	16230	30400	
Values.....	8354	300	700	34465	8936	8180	169050	203835	123625	119786	720	148650	20958	39010	8115	60800		

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Guysborough, Province of Nova Scotia,
for the Year 1905.

Number.	Districts.	Halibut, lb.	Trout, lb.	Shad, brls.	Smelts, lb.	Alewives or Kaspareau, brls.	Bas, lb.	Eels, brls.	Flounders, lb.	Tom cod or Frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Clams, brls.	TOTAL VALUE OF ALL FISH.	Number.
<i>Guysborough Co.</i>																			
1	Beam Secum.	1000	400			1		20	1000	800			50	150	100	80	10	4,572 25	1
2	Marie Joseph.	2000	100					30	1000	600	100		50	200	120		15	8,117 75	2
3	Liscomb and Spanish Ship Bay	600	500		500	2	300	5	1000	1000	100	100	100	300	300	400	10	17,744 25	3
4	Gegogin.	500	300					5	800	600			40	100	75	150	6	5,912 00	4
5	St. Mary's Bay and River	150	400	3	3000	4	300	10	500	600			10	20	60		5	3,581 50	5
6	Wine Harbour.	200	100					6	600	500			25	20	65		5	1,804 00	6
7	Port Hillford and Lake.	2500	300		9000	1		30	1000	450			30	100	80		3	4,880 25	7
8	Holland Harbour and Indian River.	400	500					3	2000	130			15	15	75		8	1,999 25	8
9	Port Beckerton.	500				1		20	2000	800			150	400	120	250	6	12,903 50	9
10	Fisherman's Harbour.	300	100		100			3	1000	500			100	160	100	200	2	9,476 00	10
11	Country Harbour.	200	1000		1000	1	200	6	1000	400			10	20	25			1,103 50	11
12	Isacs Harbour.	4000	600		500			15	1000	500			40	80	100	280		10,874 25	12
13	Drum Head.	9000				2		6	2000	600	300		150	300	150		6	10,517 50	13
14	Seal Harbour.	1300	300					8	2000	500	100		40	150	100	260	2	11,015 75	14
15	Coddles Harbour.	2300	300					3	2000	500	100		40	150	100	200	3	8,237 00	15
16	New Harbour.	4500	1000		1500	3	150	10	1000	1000	300		75	500	120	120		15,804 50	16
17	Tor Bay.	700						20					20	660	150	50		8,776 75	17
18	Larry's River.	4500	1000		300	16		60			10		120	2000	550			17,521 50	18
19	Charles's Cove.	2680	900		260	14		50			15		40	1690	340	360		22,390 50	19
20	Cole Harbour.	2000						200			8		30	1000	200			9,923 00	20
21	Port Felix.	2500	1200		300	63		160		30			40	2850	590	170		26,331 50	21
22	White Head.	3240	400		200	12		40		80			100	3470	650	530		46,550 50	22
23	Raspberry and Dover.				100	1		50			5		25	1020	300	620		36,691 50	23
24	Canso and Canso Title.	444780	1000	25	6000	500	2000	150	2000		9470	200	46870	10000	334000			773,861 50	24
25	Fox Island Main.					1		5			300		500	80				6,271 25	25
26	Half Island Cove.					5					400		1000	300				57,491 00	26
27	Philips Harbour.							2			50		400	120				9,935 00	27
28	Queensport.	5000	100		10			10	1000		500		4000	300	430			88,392 00	28
29	Peas Brook.							6			20		700	200				8,021 25	29
30	Halfway Cove.		600					20			100		690	400				20,365 50	30
31	Sandy Cove and Cooks Cove.	30	700		2000	5		25			5		500	320				22,181 25	31
32	Guysboro and Manchester.	500	1000		3550	15		40					580	130				16,192 50	32

SESSIONAL PAPER No. 22

Return showing the Kinds and Quantities of Fish and Fish Products in the County of Guysborough, Province of Nova Scotia, for the year 1905.

Districts.	Halibut, lb.	Trout, lb.	Shad, brls.	Smelts, lb.	Alewakes or Kaspareau, brls.	Bass, lb.	Eels, brls.	Flounders, lb.	Tom cod or Frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Clams, brls.	TOTAL VALUE OF ALL FISH.	Number.
<i>Guysborough Co.</i>																		
33 Port Shoreham ..	493880	18400	28	29260	750 2950	1155	21900	9400	13493	4200	71855	17670	338100	57	107	.....	.....	15,793 50 33
34 St. Francis ..					6	20						280	300				.....	12,975 75 34
35 Oyster Ponds ..					54	30						150	280				.....	17,013 25 35
36 Sand Point ..					6	10			200			140	200				.....	6,644 50 36
37 Steep Creek ..					10	15			300			120	300				.....	19,521 00 37
38 Mulgrave and Aulds Cove ..				1000	4		30			1000		100	90				.....	18,181 00 38
Totals ..	493880	18400	28	29260	750 2950	1155	21900	9400	13493	4200	71855	17670	338100	57	107	.....	.....	.....
Values ..	49388	1840	280	1463 3000	295	11550	1095	470	53972	8400	21556	26505	169050	71	214	.....	.....	1,385,018 75

RETURN showing the Number of Fishing Vessels, Boats and Nets, &c., in the County of Halifax, Province of Nova Scotia, for the Year 1905.

FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.													
Number.	Districts.	Vessels.			Boats.		Gill-nets.		Seines.		Trawls.		Lobster Canneries, No.	Number.			
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.			Value.		
Halifax Co.																	
1	North Shore.....	6	130	7,600	44	150	3,000	200	1,500	30,000	8,100	62	7,240	17,050	150	600	1
2	East St. Margarets.....	8	128	4,000	40	200	4,000	400	4,000	80,000	20,500	28	2,520	8,200	304	1,520	1
3	Indian Harbour.....	4	120	2,000	25	60	1,200	70	1,500	100,000	25,300	26	2,160	7,900	664	2,656	2
4	Peggy's Cove.....	4	120	2,000	25	250	5,000	200	1,800	30,000	8,100	26	2,440	7,900	140	700	3
5	Dover.....	1	35	500	9	183	7,320	90	1,435	36,000	10,800	86	8,340	31,400	700	2,800	4
6	Prospect.....	7	108	3,500	35	150	3,000	100	1,500	28,100	10,760	73	7,620	25,950	65	460	5
7	Terrence Bay.....	8	139	1,500	15	36	720	100	1,500	30,000	8,100	25	2,050	7,500	350	1,400	6
8	Pennant.....	4	67	3,100	28	35	600	40	200	4,000	1,600	10	1,080	3,000	144	576	7
9	Sambro.....	3	49	1,500	15	30	720	40	200	4,000	1,600	10	1,080	3,000	144	576	8
10	Ketch Harbour.....	2	30	625	8	35	700	30	600	1,200	3,160	13	1,450	3,950	80	320	9
11	Portuguese Cove.....	6	192	3,500	42	100	2,000	50	800	1,600	5,200	24	1,920	7,600	100	400	10
12	Herring Cove.....	14	49	5,000	10	11	220	15	23	460	1,100	4	350	1,350	40	200	11
13	Ferguson's Cove.....	15	49	5,000	10	18	360	24	25	500	1,125	4	310	1,350	14	14	12
14	Bedford and Grand Lake.....	1	49	5,000	10	66	1,200	54	260	15,000	1,050	12	1,040	3,800	15	15	13
15	Halifax.....	1	49	5,000	10	66	1,200	54	260	15,000	1,050	12	1,040	3,800	15	15	15
16	Bedford and Devils Island.....	1	49	5,000	10	66	1,200	54	260	15,000	1,050	12	1,040	3,800	15	15	16
17	Eastern Passage and Three Fathom Harbour.....	5	298	12,000	74	30	425	28	70	4,200	300	19	19	19	19	19	17
18	Cow Bay and Lawrence town.....	22	420	3,600	86	30	420	22	60	3,600	260	21	21	21	21	21	17
19	Seaforth and Three Fathom Harbour.....	2	53	1,700	12	54	1,100	43	85	5,250	375	23	23	23	23	23	18
20	West Chezetook.....	6	133	4,500	30	63	1,500	50	150	9,000	650	1	60	30	124	124	20
21	East Chezetook.....	2	53	1,700	12	54	1,100	43	85	5,250	375	23	23	23	23	23	20
22	Petpeswick Harbour.....	2	53	1,700	12	54	1,100	43	85	5,250	375	23	23	23	23	23	22
23	Musquodoboit Harbour.....	6	133	4,500	30	63	1,500	50	150	9,000	650	1	60	30	124	124	23
24	Jeddore.....	6	133	4,500	30	63	1,500	50	150	9,000	650	1	60	30	124	124	24

6-7 EDWARD VII., A. 1907

SESSIONAL PAPER No. 22

RETURN showing the Number of Fishing Vessels, Boats and Nets, &c., in the County of Halifax, Province of Nova Scotia, for the Year 1905.

FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.																
Number.	DISTRICTS.				Vessels.			Boats.		Gill-nets.			Seines.			Trawls.		Lobster Canneries, No.	Number.	
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.					
<i>Halifax Co.</i>																				
25	Clam Harbour and Owl's Head	1	14	300	4	80	1,650	56	255	15,500	1,100	5	4,320	795	295	2	25			
26	West Ship Harbour	2	28	450	8	24	465	18	80	4,800	320	2	27	1,260	126	1	26			
27	East Ship Harbour	2	28	450	8	24	711	27	82	1,640	246	2	27	1,260	126	1	27			
28	Pleasant Harbour and Tangier	3	42	1,150	11	51	1,514	57	197	3,940	591	7	135	135	135	7	28			
29	Pope's Harbour and Gerrard's Island	1	13	200	4	20	525	24	145	2,900	435	2	180	150	20	1	29			
30	Spry Bay, Taylor's Head and Mushaboom	3	43	1,000	9	70	2,612	90	510	10,200	1,530	3	35	35	230	3	30			
31	Sheet Harbour and Soler Island	4	87	2,300	18	34	1,175	53	185	3,600	95	2	135	70	114	1	31			
32	Beaver Harbour and Port Duff	1	13	200	4	20	525	24	145	2,900	435	2	180	150	20	1	32			
33	Quoddy and Harrigan Cove	1	13	200	4	20	525	24	145	2,900	435	2	180	150	20	1	33			
34	Moser River and Smith's Cove	1	13	200	4	20	525	24	145	2,900	435	2	180	150	20	1	34			
35	Mitchell's Bay and Ecum Se-cum	1	13	200	4	20	525	24	145	2,900	435	2	180	150	20	1	35			
Totals		69	1,639	54,925	426	2,484	54,207	2,321	21,690	466,080	115,399	460	48,012	143,360	14,701	21	21			

6-7 EDWARD VII., A. 1907

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Halifax, Province of Nova Scotia, for the year 1905.

DISTRICTS.	SALMON.		HERRING.		MACKEREL.		LOBSTERS.		COD.		HADDOCK.		HAKE.		Pollock, cwt.	Halibut, lb.	Number.
	Fresh, lb.	Smoked, lb.	Salted, brls.	Fresh, lb.	Smoked, lb.	Fresh, lb.	Salted, brls.	Preserved in cans, lb.	Fresh in shell, cwt.	Dried, cwt.	Tongues and sounds, brls.	Fresh, lb.	Dried, cwt.	Sounds, lb.			
<i>Halifax Co.</i>																	
1 North Shore	2000	100	1300	1000	3000	100	.....	.....	200	300	3	400	50	90	30	120	1
2 East St. Margarets	4000	100	2000	1000	5000	150	.....	.....	1000	2800	6	200	60	1000	600	200	2
3 Indian Harbour	3000	100	1200	800	65000	40	.....	.....	1000	2800	4	600	100	1200	700	200	3
4 Peggy's Cove	3000	.....	200	500	29000	10	.....	.....	500	250	1	500	50	75	25	80	4
5 Dover	6000	100	1300	300	70000	60	.....	.....	3000	600	12	600	600	1600	800	200	5
6 Prospect	4000	.....	1000	400	75000	21	348	.....	2000	500	8	1000	250	900	400	200	6
7 Terrence Bay	1000	.....	700	500	40000	35	19200	.....	1000	1000	7	1600	400	400	300	100	7
8 Penant	1200	.....	400	400	25000	12	.....	.....	200	1500	12	1500	100	400	300	100	8
9 Sambro	1200	.....	100	300	1200	3	35424	.....	1000	1500	8	1500	50	350	300	200	9
10 Ketch Harbour	300	.....	200	400	2000	2	.....	.....	200	400	6	8000	60	200	200	80	10
11 Portuguese Cove	2000	.....	700	300	45000	.....	.....	.....	700	100	1	12000	25	200	150	40	11
12 Herring Cove	1000	.....	2500	.....	10000	.....	.....	.....	500	1000	12	25000	60	600	300	40	12
13 Ferguson's Cove	2000	.....	100	200	2000	.....	.....	.....	700	100	3	2200	30	100	100	20	13
14 Bedford and Grand Lake	2000	.....	40	300	1500	100	.....	.....	50	100	2	2000	.....	10	10	10	14
15 Halifax .....	.....	.....	10	500	1000	.....	.....	.....	25	12	.....	1000	.....	.....	15	10	15
16 Dartmouth .....	.....	.....	10	.....	.....	.....	.....	.....	.....	225	.....	.....	25	.....	5	600	16
17 Eastern Passage and Devil's Island	160	.....	60	5000	3000	8	.....	.....	5500	518	1	111500	16	.....	28	4800	17
18 Cow Bay and Lawrence-town	400	.....	55	500	350	6	.....	.....	.....	77	.....	1200	.....	.....	32	1500	18
19 Seaforth and Three Fathom Harbour	350	.....	288	.....	300	3	.....	.....	.....	30	.....	.....	9	.....	9	300	19
20 West Chezetcook .....	.....	.....	1040	.....	.....	21	.....	.....	.....	2891	1	.....	245	.....	35	6420	20
21 East Chezetcook .....	.....	.....	32	.....	.....	2	.....	.....	.....	105	.....	.....	27	.....	13	580	21
22 Petpeswick Harbour .....	.....	.....	15	1000	858	1	38648	.....	.....	300	.....	3500	44	.....	65	520	22
23 Musquodoboit Harbour	2000	200	42	500	.....	2	.....	.....	.....	600	.....	2000	65	4	55	100	23

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Halifax, Province of Nova Scotia,
for the year 1905.

DISTRICTS.	SALMON.		HERRING.		MACKEREL.		LOBSTERS.		COD.	HADDOCK.		HAKE.		Number.			
	Fresh, lb.	Smoked, lb.	Salted, brls.	Fresh, lbs.	Salted, brls.	Fresh, lb.	Salted, brls.	Preserved in cans, lbs.		Fresh in shell, cwt.	Dried, cwt.	Tongues and sounds, brls.	Dried, cwt.		Sounds, lb.		
24 Jeddore.....	350	50	140				6			1527		89	19500	68	156	120	3550 24
25 Clam Harbour and Owl's Head.....	150	150	752				18	43392	595	323		22		52	120	13	2450 25
26 West Ship Harbour.....			88				12			76		16		13	18	10	370 26
27 East Ship Harbour.....			191				4			148		8				7	2790 27
28 Pleasant Harbour and Tangier.....	450		1769				39			620		98		14	26	53	2160 28
29 Pope's Harbour and Gerard's Island.....	40		628				15	24480	91	150		4		20	24	16	1240 29
30 Spry Bay, Taylor's Head and Mushaboon.....			2175				53	54720	430	630		68		163	210	82	1000 30
31 Sheet Harbour and Sober Island.....	600		1060				6	384	147	270		25		109	196	11	2540 31
32 Beaver Harbour and Port Dufferin.....			42				1	56256	666	133		3				2	980 32
33 Quoddy and Harrigan Cove.....			314				4	75736	734	125		5				3	500 33
34 Moser River and Smith's Cove.....	500	300	2							15		2				1	..... 34
35 Mitchell's Bay and Ecum Secum.....			156				32	63792	445	169		5		1		8	3690 35
Totals.....	37700	1100	19919	13900	8000	480730	666	407380	21541	20184	87	2611	195800	7269	4961	2053	339890
Values.....	7540	220	89635	139	160	57687	9990	101845	150787	90828	870	7833	5874	16355	2481	4106	33989

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Halifax, Province of Nova Scotia, for the Year 1905—*Concluded*.

Number.	Districts.	Trout, lb.	Shad, brls.	Smelts, lb.	Alwives or Gasper-eau, brls.	Bas, lb.	Eels, brls.	Oysters, brls.	Flounders, lb.	Tom-cod or Frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Clams, brls.	TOTAL VALUE OF ALL FISH.	Number.
	<i>Halifax Co.</i>																	\$ cts.	
1	North Shore	2000			60		3		20000	1800	200	110	200	40	90	4	40	21,269 50	1
2	East St. Margarets	1000	60		40		8		25000	6000	140	140	1000	90	100	1	45	48,282 25	2
3	Indian Harbour	500			30		6		30000	4000	90	150	1500	80		3	16	35,631 75	3
4	Peggy's Cove	36			20		1		10000	12000	12	85	300	24			10	11,893 25	4
5	Dover	400	25		40		6		12000	11000	15	600	2000	80	12		45	51,147 00	5
6	Prospect	400			55		4		11000	12000	18	1000	600	90	20		20	38,453 00	6
7	Terrence Bay	1000			40		10		20000	9000	18	600	700	100	200	3	11	31,319 75	7
8	Penant	300			30		6		1000	10000	20	600	900	100	12		28	17,727 00	8
9	Saunbo	300			20		3		1000	8000	15	1100	900	100	400		10	28,590 50	9
10	Ketch Harbour	100			68		4		2000	6000	12	760	200	60			20	8,214 00	10
11	Portuuese Cove	100			10		1		1600	5000	8	420	200	36			2	16,983 00	11
12	Herring Cove	90			12		6		1800	6000	25	310	1000	100	20		10	49,987 03	12
13	Ferguson's Cove	50			5		2		1000	4000	7	28	700	40			3	8,598 00	13
14	Bedford and Grand Lake	4000			75	100	8		500	1000	5		30	10			6	2,576 50	14
15	Halifax	800			1					1000	1			4				593 00	15
16	Dartmouth																	1,202 50	16
17	Eastern Passage and Devil's Island				8		4		7000				225	80			15	46,241 50	17
18	Cow Bay and Lawrencetown			1200	4		5		5000				25	10	8		5	1,473 50	18
19	Seaforth and Three Fathom Harbour	300		10000	10		5		5000				16	8	2		10	2,564 80	19
20	West Chezetcook	200		8000	6		7		8000				910	144			500	21,854 50	20
21	East Chezetcook	700		1350	5		6		8000				60	16			45	1,611 00	21
22	Petpeswick Harbour	1000		750	2		10		5000				130	32	340		70	17,172 00	22
23	Musquodoboit Harbour	1200			1		10	5	6000				325	70			35	5,558 50	23
24	Jeddore	500		2000	2		12		9000				700	70			30	10,452 50	24
25	Clam Harbour and Owl's Head	370		2500	1		3		13000				140	36	440		200	22,256 50	25
26	West Ship Harbour	300		1000	8		5		5000				10	46			7	1,559 25	26
27	East Ship Harbour	100										50	198	10	50		2	2,115 90	27
28	Pleasant Harbour and Tangier	400					7					20	750	36	20		11	9,442 00	28

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Halifax, Province of Nova Scotia, for the Year 1905—Concluded.

DISTRICTS.	Trout, lb.	Shad, brls.	Smelts, lb.	Alewives or Gasper-eau, brls.	Bass, lb.	Eels, brls.	Oysters, brls.	Flounders, lb.	Tom-cod or Frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.	Clams, brls.	TOTAL VALUE OF ALL FISH.	Number.
																	% cts.	
<i>Halifax Co.</i>																		
29 Pope's Harbour and Gerrard's Island.....												263	10	250	47	4	11,001 65	29
30 Spry Bay, Taylor Head and Mushaboom.....						15						666	30	560		9	31,986 65	30
31 Sheet Harbour and Sober Island.....	400					10						286	22		38	8	8,360 55	31
32 Beaver Harbour and Port Dufferin.....						15						56	2	570		3	20,100 30	32
33 Quoddy and Harrigan Cove.....	300					60						99	4	800		2	27,248 00	33
34 Moser River and Smith's Cove.....						30						7					546 60	34
35 Mitchell's Bay and Ecum Secum.....												5	8	640		2	21,780 95	35
Totals.....	1740	85	3880	553	100	272	5	207900	186800	586	5978	15220	1592	4534	96	1244	.....
Values.....	1744	850	1940	2212	10	2720	25	10395	9340	2344	11956	4566	2388	2267	120	2488	635,704 85	

RETURN showing the Number of Vessels, Boats, Nets, &c., and the Quantity and Value of all Fish in the County of **Hants**,
Province of **Nova Scotia**, for the Year 1905.

DISTRICTS.	FISHING BOATS.				FISHING GEAR AND MATERIALS.						KINDS OF FISH.										TOTAL VALUE OF ALL FISH.	Number.							
	Number.	Value.	Men.	Number.	Number.	Fathoms.	Trawls.		Weirs.		Salmon, fresh, lb.	Herring, salt'd, brls	Cod, dried, cwt.	Haddock, dried, cwt.	Hake, dried, cwt.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Shad, brls.	Smelts, lb.			Alewives or Gas- pereau, brls.	Bass, lb.	Flounders, lb.	Clams, brls.			
							Value.	Number.	Value.	Number.																			
		\$																									\$	cts.	
<i>Hants County.</i>																													
1 Maitland to Shubenacadie.....	25	360	35	50	1500	600						9900							400				200	3750	500		3,220	00	1
2 Shubenacadie to Grand Lake..	60	480	60	80	720	400					10000								500	15		110	4000			3,040	00	2	
3 Hantsport to Windsor.....	4	100	4	8	1000	175	2	18				250	12	84	5	2	5	720	1000	2		30			10	843	50	3	
4 Windsor to Noel.....	10	250	11	17	2800	610				6	300	900	10	50	20	5	10	250	1000	3	1000	60	600		50	1,146	25	4	
Totals.....	99	1190	110	155	6020	1785	2	18		6	300	21050	22	134	25	7	15	970	2900	20	1000	400	8350	500	60				
Values												4210	99	603	75	1575	30	97	290	200	50	1600	835	25	120	8,249	75		

SESSIONAL PAPER No. 22

RECAPITULATION

OF the Yield and Value of the Fisheries in District No. 2, Province of Nova Scotia,
with comparative statements of the increase or decrease for the years 1904 and
1905.

Kinds of Fish.	Quantity, 1905.	Rate.	Totals.	QUANTITIES.	
				Increase.	Decrease.
		\$ cts.	\$ cts.		
Salmon, fresh	lb.	245,350	0 20	49,070 00	10,232
" preserved in cans	"	2,000	0 15	300 00	2,000
" smoked	"	4,600	0 20	920 00	2,029
Herring, salted	brls.	30,175	4 50	135,787 50	9,415
" fresh	lb.	1,052,200	0 01	10,522 00	478,175
" smoked	"	604,200	0 02	12,084 00	311,200
Mackerel, fresh	"	1,903,905	0 12	228,468 60	384,085
" salted	brls.	14,282	15 00	214,230 00	8,667
Lobsters, preserved in cans	lb.	2,009,420	0 25	502,355 00	51,256
" fresh, in shell	cwt.	31,841	7 00	222,887 00	15,892
Cod, dried	"	48,780	4 50	219,510 00	4,908
" tongues and sounds	brls.	159	10 00	1,590 00	16
Haddock, fresh	lb.	5,171,000	0 03	155,130 00	4,408,620
" dried	cwt.	10,227	3 00	30,681 00	9,241
" smoked finnan haddies	lb.	643,500	0 06	38,610 00	27,650
Hake, dried	cwt.	13,448	2 25	30,258 00	6,449
" sounds	lb.	22,441	0 50	11,220 50	18,943
Pollock	cwt.	33,257	2 00	66,514 00	22,186
Halibut	lb.	847,590	0 10	84,750 00	682,385
Trout	"	57,625	0 10	5,762 50	12,125
Shad	brls.	333	10 00	3,330 00	311
Smelts	lb.	261,410	0 05	13,070 50	68,786
Alewives or Gaspereau ..	brls.	2,322	4 00	9,288 00	211
Bass	lb.	22,950	10 00	2,295 00	12,600
Eels	brls.	1,560	10 00	15,600 00	500
Oysters	"	936	5 00	4,680 00	113
Flounders	lb.	258,984	5 00	12,948 20	57,134
Tom-cod	"	201,750	5 00	10,087 50	152,800
Squid	brls.	14,145	4 00	56,580 00	8,941
Coarse or mixed fish	"	11,906	2 00	23,812 00	9,205
Fish oil	galls.	88,858	0 30	26,657 40	2,932
Fish used as bait	brls.	25,807	1 50	38,710 50	8,711
Fish products as fertilizer	"	355,994	0 50	177,997 00	329,643
Seal skins	No.	153	1 25	191 25	83
Clams	brls.	2,622	2 00	5,244 00	678
Total for 1905				2,421,151 45	
" 1904				1,758,282 30	
Increase				662,869 15	

6-7 EDWARD VII., A. 1907

RECAPITULATION.

SHOWING the Number and Value of Fishing Vessels, Boats, &c., in District No. 2,
Province of **Nova Scotia**, for the Year 1905.

Material.	Value.	Total.
	\$	\$
140 vessels, (2,953 tons).....	122,525	
5,804 boats.....	156,500	
39,245 gill nets, (849,985 fathoms).....	286,508	
496 seines, (51,240 fathoms).....	14,165	
76 trap nets.....	33,050	
6,887 trawls.....	47,886	
22 weirs.....	1,210	
232 smelt bag-nets.....	3,875	
14,526 hand lines.....	9,257	
		674,976
118 lobster canneries.....	107,875	
294,709 " traps.....	214,045	
		321,920
70 freezers and ice-houses.....	126,832	
1,824 smoke and fish houses.....	193,596	
927 piers and wharfs.....	166,694	
219 tugs and smacks.....	62,900	
2 clam canneries.....	1,150	
		551,172
Total.....		1,548,068

COMPARATIVE Statement of the Value of the Fisheries in each County of District No
2, Province of **Nova Scotia**, for the years 1904-1905.

County.	Value in 1904.	Value in 1905.	Increase.	Decrease.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Antigonish.....	74,291 30	75,050 60	759 30	
Colchester.....	33,703 25	25,723 50		7,979 75
Cumberland.....	147,445 50	142,374 50		5,071 00
Guysborough.....	753,483 65	1,385,018 75	631,535 10	
Halifax.....	606,419 25	635,704 85	29,285 60	
Hants.....	6,855 25	8,249 75	1,394 50	
Pictou.....	136,084 10	149,029 50	12,945 40	
	1,758,282 30	2,421,151 45	675,919 90	13,050 75
		1,758,282 30	13,050 75	
		662,869 15	662,869 15	

NOVA SCOTIA—*Con.*

District No. 3.

FISHERY STATISTICS

COUNTIES OF LUNENBURG, QUEEN'S, SHELBURNE, YARMOUTH,
DIGBY, ANNAPOLIS AND KING'S.

RETURN showing the Number, Tonnage and Value of Vessels and Boats, Nets, &c., Quantity and Value of Fish in the County of Lunenburg, Province of Nova Scotia, for the Year 1905.

Number.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						LOBSTER PLANT.		KINDS OF FISH.							
	Vessels.			Boats.			Gill Nets.			Seines.			Trap Nets.		Canneries.	Salmon, fresh, lb.	Salmon, smoked, lb.	Herring, salted, brls.	Herring, fresh, lb.	Mackerel, fresh, lb.	Mackerel, salted, brls.	
	Number.	Tonnage.	Value.	Men.	Number.	Value.	Number.	Fathoms.	Value.	Number.	Fathoms.	Value.	Number.	Value.								
<i>Lunenburg Co.</i>																						
1 Fox Point.....	1	16	350	5	129	2500	135	30	6000	1600	25	2500	9000	11	2000	.....	140	.....	25	300	400	100
2 Mill Cove.....	.....	.....	.....	.....	200	2320	220	30	8000	2400	22	2500	1500	10	2000	.....	80	.....	20	300	800	200
3 Lodge & N. W. Cove.....	.....	.....	.....	.....	75	1000	85	22	1900	370	17	2200	1650	9	1300	.....	70	.....	33	.....	300	150
4 Aspotogan.....	.....	.....	.....	.....	45	360	60	4	1000	200	7	850	700	3	500	1	700	.....	25	.....	50	75
5 Bayswater & Blandford.....	.....	.....	.....	.....	170	1750	190	8	2000	400	15	1400	780	8	700	.....	45	.....	30	.....	38	17
6 Deep Cove.....	.....	.....	.....	.....	20	140	22	2	200	100	4	550	500	2	180	.....	20	.....	10	.....	20	15
7 Chester Bay.....	1	40	900	6	152	3000	77	250	13500	3400	15	1200	3000	12	3000	2	1000	6000	350	40	1000	400
8 Mahone Bay and Martin River.....	24	2000	84000	408	215	3000	235	300	15000	4000	10	1000	2500	5	1250	.....	3000	110	85	500	3000	20
9 Little and Big Tancook Islands.....	.....	.....	.....	.....	360	7820	390	30	6800	1500	45	4400	4400	17	1800	.....	170	.....	700	500	500	150
10 Lunenburg Harbour to Kingsbury.....	73	6214	372840	1161	630	15200	175	1300	26000	13000	6	600	1200	40	8000	1	200	.....	650	6000	4000	130
11 LaHave River District.....	59	5262	315720	973	530	13200	154	1350	27000	13500	8	800	2000	8	1600	1	200	7500	3300	8000	2000	110
12 Petite Riviere to Port Medway.....	4	253	15180	45	102	3500	67	800	16000	8000	2	200	400	2	400	.....	10000	.....	560	800	750	3
Totals.....	162	13785	788990	2598	2619	53790	1810	4126	123200	58470	176	18200	27630	127	22730	5	2100	27055	5480	17400	11658	980
Values.....\$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5411	92	24660	174	1399	14700

DISTRICTS.		KINDS OF FISH AND FISH PRODUCTS.																	TOTAL VALUE OF ALL FISH.							
Number.		Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked finnan haddies, lb.	Hake, dried, cwt.	Hake sounds, lb.	Pollock, cwt.	Haitbut, lb.	Trout, lb.	Smelts, lb.	Alwives or Gas- pereau, brls.	Eels, brls.	Clams, brls.	Flounders, lb.		Tom cod or Frost fish, lb.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.		
Lunenburg Co.																										
1	Rox Point.....		5	300	40	50	70	120	30	50	30	500	30	30	3	24000	20000	150	300	100	300	20	300	20	5935 50	
2	Mill Cove.....		8	200	1	30	150	25	25	15	25	20000	150	30	12	20000	20000	150	30	100	400	20	400	20	6107 15	
3	Lodge & N. W. Cove.....		13	95		70	70	30	30	30	30	26000	95	86	10	26000	95	86	95	55	55	86	20	20	4560 19	
4	Apostogan.....	40000	8	20	20	25	10	18	16	16		12000	45	50		12000	45	50	45	30	50	50	50	50	12056 75	
5	Bayswater & Bland- ford.....		4	52		70	112	34	65	65	130	20	28000	100	190	28000	100	190	100	190	48	190	48	190	48	2759 56
6	Deep Cove.....		3	30		25	20	10	10	5		10000	75	20		10000	75	20	12	15	20	12	15	15	1016 15	
7	Cluster Bay.....	40000	350	800	5	1000	25	200	20	12	400	600	1000	40	12	5	30000	1000	200	200	130	200	14	200	21115 00	
8	MaHone Bay and Mar- tin River.....		10	30000	50	2000	60	400	400	100	170	15000	200	800	10	4	9000	4000	100	600	503	600	503	600	142051 50	
9	Little and Big Tan- cock.....		45	240		550	500		83	100	115	16000				51000			890	430	1000	150	150	150	14186 25	
10	Lunenburg Harbour to Kingsbury.....	18624	500	64115	60	6000	7705	3141	3141	3135	63330				7			4000		35000					357863 75	
11	La Have River District	4656	150	54922	35	3000	366		3	362	2265			10000	5	18	60	2000		30000					280688 25	
12	Petite Riviere to Port Medway.....		400	2622	8	700	13				22	590		2000	40	12		1000		1500					21493 00	
Totals		103290	1496	153396	199	19520	9101	600	3884	240	3997	83515	875	13800	117	69	69	210000	12400	1925	68013	2738	219			869832 96
Values,.....\$		25820	14960	690252	1990	586	27303	36	8739	120	7994	8351	88	690	408	690	138	6300	372	3850	20404	4107	109			869832 96

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity of all Fish in the County of Queen's, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.				LOBSTER PLANT.		KINDS OF FISH.						Number.			
		Vessels.			Boats.			Gill Nets.				Canneries.		Herring, fresh, lb.		Herring, smoked, lb.		Mackerel, fresh, lb.			Mackerel, salted, brls.		
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Value.	Salmon, fresh, lb.	Salmon, smoked, lb.	Herring, salted, brls.	Herring, fresh, lb.	lb.	lb.		lb.	brls.	
		<i>Queen's Co.</i>																					
1	Port Medway.....	3	162	9125	34	82	2775	200	255	5000	2210	.....	.....	5900	480	500	.....	.....	.....	.....	.....	.....	1
2	Mill Village.....					22	150	30	30	670	120	.....	.....	9000	1370	.....	.....	.....	.....	.....	.....	.....	2
3	Greenfield.....					17	200	35	100	2000	50	.....	.....	3375	420	.....	.....	.....	.....	.....	.....	.....	3
4	Liverpool, Brooklyn and Gull Island.....					32	500	40	80	1600	400	1	2000	780	.....	.....	.....	.....	.....	.....	.....	.....	4
5	Western Head, Black Pt. and Moose Harbour.....					70	1600	72	380	7800	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
6	White and Hunts Pt. and Summer-ville.....	1	14	150	4	38	680	42	150	3000	750	1	200	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
7	Port Monlon.....	3	36	500	10	80	1800	84	174	2000	870	4	1800	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
8	Ports Joli and Hebert.....					58	1050	60	100	2200	650	2	350	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
9	Eagle Head and Beach Meadows.....					20	300	26	41	400	200	.....	.....	220	.....	.....	.....	.....	.....	.....	.....	.....	9
10	Berlin, Milton and Kempt.....					50	750	60	100	2100	550	1	250	2100	.....	.....	.....	.....	.....	.....	.....	.....	10
Totals		7	212	9775	48	469	9805	649	1410	26770	7700	9	4600	21375	2270	2100	7700	2700	8900	620	.....	.....	620
Values.....\$.														4275	454	9450	77	54	1068	9300	.....	.....	9300

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Kinds of Fish, &c.—Nova Scotia—Con.

Number.	DISTRICTS.				FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						LOBSTER PLANT.		KINDS OF FISH.					Number.	
					Vessels.			Boats.			Gill Nets.			Trawls.		Smelt Nets.	Canneries.		Herring, fresh, lb.	Herring, smoked, lb.	Mackerel, fresh, lb.	Mackerel, salted, brls.			
					Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Value.										
Shelburne Co.																									
1	Woods Harbour	4	60	2800	20	150	6000	190	665	20000	5350						6	2100	400					1	
2	Shag Harbour and Bear Point	3	52	2100	18	90	2960	105	1080	31500	8640						3	800	625					2	
3	Cape Island	36	327	14400	140	520	39000	875	5000	85000	40000						5	2000	3500					3	
4	Barrington	5	112	8000	35	64	1920	64	430	7310	3540						1	100	100					4	
5	Port La Tour and Baccaro	12	136	4800	60	415	8300	415	4000	68000	32000								500					5	
6	Cape Negro and Island and Port Clyde	3	41	1800	15	159	3710	160	2431	41330	19450						2	600	2400					6	
7	N. E. and N. W. Harbour to Port Saxon	3	93	5000	27	20	500	20	150	4500	750								700	100	500	2000	100	7	
8	Black Point to Round Bay					50	1250	100	600	18000	3000	40	200	4	165					70	300	3000	200	8	
9	Roseway to Carleton and McNutt's Island	1	11	500	6	50	2500	100	300	9000	1500	60	300							100	500	300	500	9	
10	Gunning Cove to Birchtown					30	750	60	150	4500	750	30	150						25	50	1000	1000	300	10	
11	Shelburne and Sandy Point	8	428	25000	88	40	1100	80	500	15000	2500	75	375				1	700	550	515	1200	2000	200	11	
12	Jordan					40	1000	70	300	9000	1500	40	200	3	120				632	280	1500	2000	100	12	
13	Lockeport	14	435	20000	116	100	1500	250	500	15000	2500	200	1000				3	5200	150	675	3000	500	200	2	
Totals		88	1695	84400	525	1728	70490	2489	16106	328140	121480	462	2310	7	285		21	11800	4757	7640	8000	10800	1600	4	
Values																			991	34380	80	216	192	60	

In Nos. 7 to 13 add 289 fishing dories, value \$2,890.

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Shelburne, Province of Nova Scotia, for the Year 1905.

DISTRICTS.		KINDS OF FISH.																	TOTAL VALUE OF ALL FISH.	Number.					
Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod dried, cwt.	Cod, tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked finnan haddies, lb.	Hake, dried, lb.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Smelts, lb.	Alwives or Gaspereau, brls.	Eels, brls.	Clams, brls.	Flounders, lb.	Tom-cod or frost fish, lb.	Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.		\$	cts.		
Shelburne Co.																									
1 Woods Harbour	177600	2765	6842	700	200	...	...	200	250	...	...	...	...	...	...	...	...	...	...	225	8000	117,752	50	1
2 Shag Harbour and Bear Point	91200	1740	2700	1100	225	...	...	1560	900	200	...	25	...	...	...	...	...	...	...	360	1500	61,558	50	2
3 Cape Island	196224	9600	36250	9500	4000	...	...	19000	19000	...	...	...	...	75	...	...	...	...	...	2400	10000	319,986	00	3
4 Barrington	...	1182	9000	1300	250	...	...	4700	360	300	...	380	25	...	...	...	...	...	...	170	2600	68,846	00	4
5 Ports La Tour and Bac- caro	18182	7678	22000	1700	2700	5000	...	1275	4700	...	...	...	50	...	...	...	...	...	...	385	2200	200,212	00	5
6 Cape Negro and Island and Port Clyde	44736	2950	20200	1200	1125	...	...	800	1275	400	...	160	...	...	...	...	...	...	...	750	1950	169,045	00	6
7 N. E. and N. W. Har- bour to Port Saxon	...	200	1000	3	1400	460	120	50	10300	500	200	40	3	60	300	400	2	...	...	175	12	10,468	50	7
8 Black Pt. to Round Bay	...	600	150	1	500	280	2	10	510	225	200	200	7	10	1300	500	1	15	200	150	9,313	00	8
9 Roseway to Carleton and McNutt's Island	...	440	260	1	500	330	7	122	2000	300	300	25	12	15	2000	400	1	10	150	75	8,114	25	9
10 Gunning Cove to Birch- town	...	200	100	...	1600	50	...	11	100	300	100	25	5	7	1000	1200	1	...	...	50	20	3,272	00	10
11 Shelburne and Sandy Pt.	22320	485	4300	3	4000	200	30	75	1115	5000	600	100	10	356	1500	1200	2	7	2137	80	35,998	60	11
12 Jordan	...	225	200	1	1500	240	300	60	350	1000	2800	35	7	5	1000	1200	1	2	150	20	6,160	40	12
13 Lockeport	68400	3500	5000	5	5000	1500	430	1900	15000	600	500	20	7	200	1000	600	20	4	2500	350	90,775	00	13
Totals	618662	31565	114002	14	29400	11560	589	29763	55860	8825	4700	1010	126	728	8100	5500	28	38	9652	26957
Values	154065	315650	513009	140	882	34680	1325	59526	5586	883	235	4040	1260	1456	243	165	112	76	2896	40435	1,173,501	75	...

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity of Fish in the County of Yarmouth, Province of Nova Scotia, for the Year 1905

DISTRICTS.	FISHING VESSELS AND BOATS.				FISHING GEAR OR MATERIALS.				LOBSTER PLANT.		KINDS OF FISH.										
	Vessels.		Boats.		Gill Nets.		Trawls.		Number.	Value.	Salmon, fresh, lb.	Herring, fresh, lb.	Herring, smoked, lb.	Mackerel, fresh, lb.	Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod dried, cwt.	Cod, tongues and sounds, brls.	Number.		
	Value.	Men.	Number.	Value.	Fathoms.	Value.	Number.	Value.													
	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Value.	\$												
Yarmouth Co.																					
1	Yarmouth	8	396	11900	110	85	1275	165	520	10400	5200	250	2500	1800	16480	700	15600	281808	20000	6572	20
2	Port Maitland	7	150	5300	35	35	527	60	90	1800	900	15	150	2000	2600	330	25000	47568	.....	3695	15
3	Sandford	1	12	400	2	26	390	50	295	5900	2950	10	100	2000	7000	350	25000	.....	.....	705	10
4	Arcadia	.....	.....	.....	.....	22	330	44	50	1000	500	.....	.....	2000	14900	.....	.....	37776	.....	1163	.....
5	Pinkney Point and Comeau Hill	2	28	950	6	54	810	108	185	3700	1850	.....	.....	5500	3900	.....	.....	.....	.....	462	.....
6	Tusket	.....	.....	.....	275	4125	275	1820	36400	18200	.....	.....	.....	5500	2500	1500	.....	.....	.....	.....	.....
7	Tusket Wedge	15	158	6400	46	80	1200	160	200	4000	2000	20	200	400	8200	.....	.....	134784	.....	1255	10
8	Pubnico	17	900	57197	209	135	2025	270	170	3400	1700	10	100	1200	6350	.....	.....	185664	.....	17835	35
9	Argyle	3	39	1200	9	45	675	90	120	2400	1200	5	50	1500	1500	.....	.....	220368	.....	663	10
10	El Brook	.....	.....	.....	50	755	100	150	3000	1500	.....	.....	.....	1500	.....	.....	.....	.....	.....	.....	.....
11	Salmon River	1	20	800	6	40	600	80	120	2400	1200	.....	.....	1500	.....	.....	.....	.....	.....	187	.....
Totals		54	1703	84147	423	847	12712	1402	3720	74400	33200	310	3100	14400	63490	2880	65000	907968	20000	32537	100
Values		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2880	635	58	7800	226392	200000	146416	1000

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of Yarmouth, Province of Nova Scotia, for the year 1905.

DISTRICTS.	KINDS OF FISH.													TOTAL VALUE OF ALL FISH.	Number.					
	Haddock, fresh, lb.	Haddock, smoked, finnan haddies, lb.	Hake, dried, cwt.	Pollock, cwt.	Hallbut, fresh, lb.	Trout, lb.	Shad, brls.	Smelts, lb.	Alewives or Gaspereau, brls.	Eels, brls.	Clams, brls.	Flounders, lb.	Tom-cod or Frost fish, lb.			Squid, brls.	Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.
Yarmouth Co.																				
1 Yarmouth.	247820	3700	430	1287	49250	600	30000	.....	.....	.....	35	3000	.....	18	200	3000	350	200	322,404 90	1
2 Port Maitland	239470	1788	.....	2497	5928	.....	2000	.....	.....	.....	12	.....	.....	12	2000	2000	100	550	56,538 00	2
3 Sandford.	81730	6000	.....	70	1787	.....	1500	.....	.....	.....	15	.....	.....	1000	500	500	75	300	12,397 60	3
4 Arcadia	29700	.....	.....	73	1000	.....	7000	.....	5	25	25	.....	1200	.....	5	50	.....	.....	16,694 50	4
5 Puckney Point and Comeau Hill.	18084	.....	.....	145	.....	.....	2200	.....	.....	22	70	.....	.....	13	55	200	40	.....	3,703 12	5
6 Tusket.	.....	.....	.....	.....	.....	15000	125	25000	3500	65	20	.....	8500	.....	25	500	.....	.....	20,900 00	6
7 Tusket Wedge.	39490	.....	.....	39	100	.....	1800	.....	.....	.....	45	.....	.....	3250	50	400	1500	125	42,793 20	7
8 Pubnico	788480	.....	700	4508	.....	12000	.....	22000	30	.....	60	.....	5500	70	40	3500	200	.....	164,787 40	8
9 Argyle.	22440	.....	.....	67	.....	15000	.....	1800	130	20	40	.....	1800	.....	.....	.....	150	.....	61,366 70	9
10 Bel Brook.	.....	.....	.....	.....	.....	9000	.....	2500	620	60	30	.....	.....	.....	.....	.....	150	.....	4,990 00	10
11 Salmon River	7200	.....	.....	25	.....	.....	2000	.....	700	50	25	.....	3500	.....	.....	.....	125	.....	6,050 00	11
Total	1474414	27500	1130	8711	111065	52600	125	97800	4985	242	377	3000	23750	163	3725	10750	1815	1050	.....	.....
Values	44232	1650	2543	17422	11106	5260	1250	4890	19940	2420	754	90	713	652	7450	3225	2723	525	712,625 42	.....

Return showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity of fish, &c.—Continued.

Number.	DISTRICTS.				FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						LOBSTER PLANT.		KINDS OF FISH.								
					Vessels.		Boats.		Gill Nets.		Seines.		Trawls.		Canner-ies.			Herring, fresh, lb.	Herring, smoked, lb.	Mackereel, fresh, lb.	Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Number.		
					Value.	Tonnage.	Men.	Value.	Men.	Number.	Value.	Number.	Value.	Number.												Value.	Number.
<i>Digby Co.</i>																											
1 Digby	14	557	40000	175	50	3750	60	63	1260	300	2	300	550	700	16300	...	...	200	150000	210000	100	...	10000	9680	25	1
2 Bay View and Culloden	...	...	...	...	30	1000	42	37	740	190	2	100	250	52	580	...	...	50	4700	...	...	700	1240	22	2	
3 Gulliver's Cove to Wat- erford.	...	...	...	...	50	1280	59	48	960	232	4	110	115	48	595	...	...	30	580000	...	5500	...	750	1455	25	3
4 Centreville.	...	...	...	...	35	3200	50	50	1000	310	1	50	50	50	800	1	4500	400	100000	268900	1000	...	400	4780	16	4
5 Sandy and Mink Coves	...	...	...	...	45	1210	40	78	1560	375	5	660	1025	55	950	3	2900	150	32200	220650	...	14630	750	1020	12	5
6 Little River and Whale Cove.	1	14	1500	7	52	1425	76	72	1440	360	3	200	345	120	2400	1	1000	50	89700	50000	...	...	1600	1860	18	6
7 Tidville and East Ferry	...	...	...	...	26	750	36	25	500	115	...	...	...	...	38	650	...	...	50	65400	...	...	360	700	8	7
8 Tiverton and Central Grove.	2	71	3000	30	120	6200	135	120	2500	620	3	250	536	185	3675	2	1800	500	83600	25000	...	3120	1800	9085	82	8	
9 Freepoint.	12	342	8500	120	110	2750	122	110	2200	640	3	250	200	220	4400	...	...	75	176800	...	...	1030	20000	25	9	
10 Westport.	10	187	6000	95	140	3800	475	120	2400	600	11	600	2500	150	3000	...	...	80	230000	...	...	1480	8500	20	10	
11 Smith's Cove & Brigh- ton.	...	...	...	...	20	350	30	16	320	165	5	230	210	10	200	...	...	104	677800	2000	1000	...	100	5092	8	11
12 Plympton to Weymouth	...	...	...	...	27	750	44	25	500	180	...	...	...	44	530	...	...	55	13500	...	...	...	220	450	17	12
13 Beliveau's to Little Brook.	2	40	1600	15	75	1500	113	85	2125	850	1	52	20	60	600	...	...	...	456000	...	...	...	220	...	...	13
14 Comeauville and Saul- nierville.	...	...	...	...	32	480	48	15	375	150	...	...	...	...	...	1	200	...	20000	...	...	44160	...	260	...	14
15 Metagahan and River.	4	98	2100	28	40	800	70	35	1050	280	...	...	...	4	80	2	650	...	32000	...	...	57600	...	1340	...	15
16 Salmon River to Cape St. Mary's.	8	144	2500	49	27	540	54	48	1200	480	...	...	...	...	...	1	300	500	4890	...	...	41376	...	2050	...	16
Totals	53	1453	65200	519	879	2985	1454	947	20130	5947	40	2802	5795	1736	34760	11	11350	2244	2716500	578550	7600	186614	19190	67332	278	...	
Values	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10098	27165	11571	912	46653	191900	302994	2780	...

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity and Value of Fish in the County of Annapolis, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						KINDS OF FISH.				
		Vessels.			Boats.			Gill Nets.			Trawls.		Weirs.	Salmon, fresh, lb.	Herring, salted, brls.	Herring, fresh, lb.		
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.					Value.	
<i>Annapolis County.</i>																		
1	Margaretsville.	3	50	1000	9	10	200	12	20	600	200	10	100	200	2000	200	2000	1
2	Port George.					15	300	25	30	900	300	30	150	300	300	2000	2000	2
3	Port Lorne.	2	26	600	12	15	300	30	30	900	300	30	150	300	350	1500	1500	3
4	Hampton.					12	200	18	25	700	250	35	175	400	400	1000	1000	4
5	Phinney Cove.	1	11	300	3	15	300	20	20	600	200	20	600	200	500	500	500	5
6	Parkers Cove.	2	60	1500	15	12	400	20	30	900	300	50	250	300	300	300	300	6
7	Hillshum.	1	15	275	4	15	450	25	20	600	200	40	200	200	300	300	300	7
8	Litchfield.	1	10	300	3	10	300	20	20	600	200	35	175	200	100	100	700	8
9	Thorn's Cove.	1	22	1000	8	4	100	6				50	250		125			9
10	Victoria Beach.	1	49	1000	10	25	500	30	15	450	150	80	400	200				10
11	Clementsport.	1				4	200	4	3	100	30	15	75	600				11
12	Lequille & Round Hill R's, & inland lakes					50	200		50	500	300			300				12
Totals.		12	243	5975	64	187	3450	210	263	6850	2430	415	2075	13	1400	6800	2275	6500
Values.															1360	10237		65

SESSIONAL PAPER No. 22

RETURN showing the Kinds, Quantities and Values of Fish and Fish Products in the County of Annapolis, Province of Nova Scotia, for the Year 1905.

KINDS OF FISH AND FISH PRODUCTS.																	
Number.	DISTRICTS.															TOTAL VALUE OF ALL FISH.	Number.
		Herring, smoked, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Hake, dried, cwt.	Hake sounds, lb.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Bass, lb.	Fish oil, galls.	Fish as bait, brls.		
<i>Annapolis County.</i>																	
1	Margaretsville.		10	500		2000	600	300	150	400				100	50		6,785 00
2	Port George		30	500		2000	600	400	200	400	4000			150	60	40	8,935 00
3	Port Lorne		40	500		1500	700	300	200	400	1000			200	45	50	8,212 50
4	Hampton		50	400		2000	500	400	300	500	800			200	50	35	7,952 50
5	Phinney Cove		60	425		3000	900	1000	500	400				300	50	25	11,045 00
6	Parkers Cove		70	400		2000	1000	2000	600	500				300	40	30	12,875 00
7	Hillsburn		70	300		1000	1200	2000	700	400	1000			250	30	25	11,912 50
8	Litchfield		60	250		1500	1500	2500	700	500				260	60	40	13,980 50
9	Thorn's Cove		15	500	3	8000	9000	8000	1500	200				500	200	90	49,315 00
10	Victoria Beach		80	1000	4	9000	8000	7000	2000	1000				500	250	75	48,922 50
11	Clementsport	3000		100			300	200	100	75							2,060 00
12	Lequille and Round Hill R's, and inland lakes.	1000										1700	650				815 00
	Totals	4000	485	4875	7	31500	24300	24100	6950	4775	5800	1700	650	2760	845	410	
	Values	80	4850	21938	70	945	72900	54225	3475	9550	580	170	65	828	1267	205	182,810 50

RETURN showing the Number, Tonnage and Value of Vessels, Boats, Nets, &c., and the Quantity and Value of all Fish in the County of King's, Province of Nova Scotia, for the Year 1905.

Number.	Districts.	FISHING VESSELS AND BOATS.						FISHING GEAR OR MATERIALS.						KINDS OF FISH.				Number.				
		Vessels.			Boats.			Gill-nets.		Seines.		Trawls.		Weirs.		Herring, fresh, lb.	Herring, salted, brls.		Herring, fresh, lb.	Herring, smoked, lb.		
		Number.	Tonnage.	Value.	Men.	Number.	Value.	Men.	Number.	Fathoms.	Value.	Number.	Value.	Number.	Value.							
<i>King's County.</i>																						
1	Avonport and vicinity	1	15	300	3	12	175	16	50	650	3	1800	340	2480	40	2000	800	1				
2	Wolfville					2	40	4	2	40				1000	18	9000		2				
3	Starr's Pt. and Kingsport					7	90	10	2	40	1	1800	750	150	22	13000		3				
4	Medford and Blomidon					7	90	14	1	20	3	1900	300	700				4				
5	Scott's Bay, Wells' Pt. and Whelan Beach					14	393	28	31	1220	4	3870	1800	13000	213	15000	6000	5				
6	Baxter Harbour					25	350	30	40	1000	300	1	100	75	150	250	8000	457	10000	6		
7	Sheffield Vault and Race Point					4	50	6				2	300	200	2	500	13000	415	17000	7		
8	Hall's Harbour	2	38	300	6	25	450	40	31	700	300	2	300	200	2	500	17000	1000	25000	30000	8	
9	Hunting Pt. & Chipman Brook	1	14	150	3	14	240	16	14	410	150	2	350	225	10	150	2	500	15000	9		
10	Canada Creek	2	25	275	6	12	200	10	10	300	100	2	400	300		500	14000	400	12000	10		
11	Harbourville					6	60	8	10	300	100	3	450	200		750	5000	20	9000	800	11	
12	Ogilvie Wharf to County line including Morden					17	330	26	19	725	275	4	500	300		4	1000	3500	76	2000	2000	12
Totals		6	92	1025	18	145	2468	208	210	6255	2175	27	11770	4690	53	775	25	6100	92830	3076	126000	51100
Values																		18566	13846	1260	1082	

SESSIONAL PAPER No. 22

RETURN showing the Kinds and Quantities of Fish and Fish Products in the County of King's, Province of Nova Scotia, for the Year 1905.

Number.	DISTRICTS.	KINDS OF FISH.													FISH PRODUCTS.			TOTAL VALUE OF ALL FISH.	Number.			
		Mackerel, fresh, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked inman haddies, lb.	Hake, dried, cwt.	Pollock, cwt.	Halibut, lb.	Trout, lb.	Shad, brls.	Alwives or Gas- pereau, brls.	Bass, lb.	Clams, brls.	Flounders, lb.	Coarse and mixed fish, brls.			Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.
<i>King's County.</i>																						
1	Avonport and vicinity	..	..	95	600	..	..	5	17	700	8600	2	152	20	..	..	..	..	..	..	2,447 50	1
2	Wolfeville	..	..	40	1000	..	..	..	30	500	..	2	5	100	25	..	800	..	10	..	719 25	2
3	Starr's Pt. and Kingsport	..	..	25	1500	..	..	..	10	500	..	1	14	500	1000	1000	450	23	..	..	2,163 50	3
4	Medford and Blomidon	..	..	55	6600	..	..	10	65	900	..	1	10	550	..	..	2700	12	856	200	3,846 50	4
5	Scott's Bay, Wells' Pt. and Whelan Beach	950	131	300	5000	50	..	25	210	800	..	..	1	10	175	..	1100	20	500	..	12,863 10	5
6	Baxter Harbour	100	5	300	1100	..	..	..	100	..	..	..	27	600	700	1600	1600	210	..	..	8,538 25	6
7	Shedfield Vault and Race Point	700	75	17	40000	156	600	70	600	1200	..	1	20	600	..	..	9500	35	300	4000	35,675 50	7
8	Hall's Harbour	800	80	275	20800	19	..	6	300	600	..	1	22	500	..	..	2600	410	9000	..	9,474 00	8
9	Hunting Point and Chipman Brook	900	229	110	9000	10	..	6	60	300	..	..	20	250	..	..	1000	300	700	..	19,907 00	9
10	Canada Creek	600	55	25	3500	9	..	5	40	100	..	..	20	175	..	..	2500	200	800	..	8,913 00	10
11	Harbourville	400	50	40	5200	15	..	10	620	1100	2500	..	45	350	..	..	2100	620	1000	..	7,954 75	11
12	Ogilvie Wharf to County line including Morden	1300	135	138	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10,899 00	12
	Totals	5750	760	1143	94350	259	600	151	2152	6700	11100	8	345	3920	1025	1000	24350	67	2929	16210	..	..
	Values	690	7600	5143	2831	777	36	340	4394	670	1110	80	1380	392	2050	30	48700	20	4393	8105	..	123,401 35

SESSIONAL PAPER No. 22

RECAPITULATION

Of the Value of Fishing Vessels, Boats, Nets, &c., in District No. 3, Nova Scotia, for the Year 1905.

Articles.	Value.	Totals.
	\$	\$
383 fishing vessels (19,138 tons).....	1,039,512	
6,029 " boats.....	143,950	
1,134 " dories.....	14,640	1,198,102
585,745 fathoms gill-nets.....	231,402	
33,992 " seines.....	42,065	
137 trap-nets.....	42,030	
3,824 trawls.....	77,705	
62 weirs.....	13,800	
34 smelt-nets.....	915	
18,601 hand lines.....	13,213	421,130
61 lobster canneries.....	40,650	
160,147 " traps.....	147,242	187,892
186 fish freezers and ice houses.....	39,510	
1,585 smoke and fish houses.....	86,815	
701 piers and wharfs (fishing).....	229,665	
129 fishing tugs or smacks.....	78,550	434,540
Total.....		2,241,664

STATEMENT of Persons employed in the Fisheries of the above District (No. 3), 1905.

	No.
Men in fishing vessels.....	4,195
" boats.....	8,222
Persons in canneries.....	1,492
Total.....	13,909

SESSIONAL PAPER No. 22

RECAPITULATION.

SHOWING the Number, the Quantity and Value of Fishing Materials, &c.—Continued.

FISHING GEAR OR MATERIALS.				LOBSTER PLANT.				OTHER FIXTURES USED IN FISHERIES.																														
Weirs.		Smelt Nets.		Hand Lines.		Canneries.		Traps.		Persons employed in canneries.		Freezers and Ice houses.		Smoke and Fish houses.		Piers and Wharfs.		Tugs, Steamers and Smacks.																				
Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.																			
COUNTIES.																																						
District No. 1.																																						
1 Richmond.....		25	475	5620	6215	11	11300	36250	26475	1435	3	3150	870	19100	215	11875	27	5500	1																			
2 Cape Breton.....				2557	2045	11	19750	39200	29700	475	4	3040	258	7947	138	20294	21	8500	2																			
3 Victoria.....				1823	1588	18	3680	14064	10070	150	15	5875	171	7303	35	6850	4	720	3																			
4 Inverness.....				2818	5953	18	9755	47400	24775	311	15	5200	185	8524	63	52060	15	3680	4																			
District No. 2.																																						
5 Cumberland.....	5	250	172	1928	1152	576	37	23875	48500	35290	296								5																			
6 Colchester.....	3	500	9	180	12	15	2	1200	3000	1600	24								6																			
7 Pictou.....			24	1025	80	40	23	27600	54959	32350	350	20	307	22	40	1	40		7																			
8 Antigonish.....			1	15	303	151	6	6400	21150	11290	152	3	4703	102	1097	2	2000	1	300	8																		
9 Guysborough.....	8	160	18	435	5571	4911	29	30800	88100	94740	457	33	111625	699	81685	218	116350	13	35675	9																		
10 Halifax.....			8	292	7343	3531	21	18000	79000	38775	278	14	10200	993	103552	706	48304	205	26925	10																		
11 Hants.....	6	300			65	33													11																			
District No. 3.																																						
12 Lunenburg.....					4130	2175	5	2100	20870	10165	195	5	1600	391	26050	322	66205	12	1000	12																		
13 Queen's.....					900	500	9	4600	19000	17000	90	52	2000	250	6400	24	2510	15	5000	13																		
14 Shelburne.....			7	285	6665	5556	21	11800	42700	42500	388	12	6650	369	21440	201	26600	37	16200	14																		
15 Yarmouth.....	7	1000	12	180	3940	2007	15	10800	40855	40855	630	30	17500	108	9115	44	58600	50	47475	15																		
16 Digby.....	17	5300	15	450	1882	1891	11	11350	35470	35470	189	51	10050	259	17255	110	75750	15	8875	16																		
17 Annapolis.....	13	1400			440	440						9	900	109	3025					17																		
18 King's.....	25	6100			644	644			1252	1252		27	810	99	3530					18																		
Totals.....																				84	15010	291	5265	45945	38271	237	193010	591770	452307	5420	293	183607	4893	324285	2079	487438	415	159850

Showing the Kinds and Quantities of Fish and Fish Products in the Province of Nova Scotia, for the Year 1905.

KINDS OF FISH.																	
Number.	COUNTIES.	Salmon, fresh, lb.	Salmon, preserved in cans, lb.	Herring, fresh, lb.	Herring, smoked, lb.	Mackerel, fresh, lb.	Mackerel, salted, brls.	Lobsters, preserved in cans, lb.	Lobsters, fresh in shell, cwt.	Cod, dried, cwt.	Cod tongues and sounds, brls.	Haddock, fresh, lb.	Haddock, dried, cwt.	Haddock, smoked, finnan haddies, lb.	Hake, dried, cwt.	Hake sounds, lb.	Pollock, cwt.
<i>District No. 1.</i>																	
1	Richmond	3250	520 1400	6504	124550	318700	11535	237518	2168	20145	134	847250	7120	166000	608	962	3490
2	Cape Breton	1445	2000	14533	104500	14555	726	224740	15035	14707	5	13500	8677	769	769	43	4544
3	Victoria	30510	1760 1000	1418	296700	2550	85	163140	4061	10704	5	1470	3266	1000	2650	80	2970
4	Inverness	88060	2475	2495	531700	218900	4428	312526	5660	10372	55	3300	1585	1000	2650	80	37
<i>District No. 2.</i>																	
5	Cumberland	11500	.....	1052	32000	185200	3900	375936	405	850	.....	4800	440	.....	350	.....	760
6	Colchester	42930	.....	.....	1000	2000	.....	36480	.....	210	.....	3300	20	.....	10	.....	5
7	Pictou	37300	.....	225	76100	.....	.....	512740	.....	190	.....	3200	.....	.....	70	.....	6
8	Antigonish	53100	.....	698	35600	7225	27	182384	.....	593	.....	8900	145	.....	622	1250	24
9	Guysborough	41770	2000 3500	7659	893600	1408750	13589	494500	9895	26619	72	4935000	6986	643500	5120	16230	30400
10	Halifax	37700	1100	19919	13900	8000	666	407380	21541	20184	87	195800	2611	.....	7239	4361	2053
11	Hants	21050	.....	22	.....	.....	.....	407380	21541	134	.....	.....	25	.....	7	.....	15
<i>District No. 3.</i>																	
12	Lunenburg	27055	460	5480	17400	11058	980	103280	1496	153396	199	19520	9101	600	3884	240	3997
13	Queen's	21375	2270	2100	2700	8900	620	153280	2700	4540	.....	2470	680	.....	70	.....	1730
14	Shelburne	4957	.....	7640	10800	1600	4	618662	31565	114002	14	29400	11560	5300	589	.....	29763
15	Yarmouth	14400	.....	63490	2880	65000	.....	907968	24000	32537	100	1474414	1120	27500	1120	.....	8711
16	Digby	.....	.....	2244	578550	7600	.....	186614	19100	67332	278	2640160	15380	1787830	85440	35082	44409
17	Annapolis	6800	2275	2275	6500	4000	.....	485	485	4875	7	31500	24300	.....	24100	6950	4775
18	King's	92830	.....	3076	126000	54100	5750	.....	760	1143	.....	94350	259	600	151	.....	2152
Totals		549002	6755 11730	77940	5055240	2559118	32460	4917148	134061	482533	951	10328334	92155	2632350	132042	65755	138935

SESSIONAL PAPER No. 22

Showing the Kinds and Quantities of Fish and Fish Products in the Province of Nova Scotia, for the Year 1905.

COUNTIES.	KINDS OF FISH.												TOTAL VALUE OF ALL FISH.	Number.				
	Halibut, lb.	Trout, lb.	Shad, brls.	Smelts, lb.	Alwives or Gaspe- reau, brls.	Bass, lb.	Eels, brls.	Oyster, brls.	Clams, brls.	Flounders, lb.	Tom cod or frost Fish, lb.	Squid, brls.			Coarse and mixed fish, brls.	Fish oil, galls.	Fish as bait, brls.	Fish as manure, brls.	Seal skins, No.
District No. 1.																		
1 Richmond	18660	4985	.....	26550	716	.....	416	.....	188	301750	45900	1584	2719	12445	1477	.....	.....	1
2 Cape Breton	10980	5280	568	70120	252	.....	275	35	10	7100	5900	245	.....	6500	4027	.....	16	2
3 Victoria	24960	3475	.....	9800	.....	.....	122	195	.....	.....	2600	248	153	13111	1041	.....	24	3
4 Inverness	9250	4100	.....	4800	75	.....	342	300	50	.....	.....	2185	767	4190	1710	1310	.....	4
District No. 2.																		
5 Cumberland	9700	4450	151	88200	366	4000	35	573	187	3000	4500	.....	876	750	3710	6050	.....	5
6 Colchester	3000	11500	49	12000	180	3400	.....	200	975	.....	.....	.....	.....	170	30	370	.....	6
7 Pictou	.....	2400	.....	65	.....	.....	47	53	45	.....	700	.....	15	20	1187	5100	.....	7
8 Antigonish	150	535	.....	4550	8	4150	51	105	4	25684	350	66	837	833	1618	1840	.....	8
9 Guysborough	493880	18400	28	29260	750	2950	1155	.....	107	21900	9400	13493	4200	71855	17670	338100	57	9
10 Halifax	339890	17440	85	38800	533	100	272	5	1244	207900	186800	586	5978	15220	1592	4534	96	10
11 Hants	970	2900	20	1000	400	8350	.....	.....	60	500	.....	.....	.....	.....	.....	.....	.....	11
District No. 3.																		
12 Lunenburg	83515	875	.....	13800	117	.....	69	.....	69	210000	12400	.....	1925	68013	2738	219	.....	12
13 Queen's	3350	10450	20	9590	470	.....	80	.....	40	7400	.....	40	52	1680	570	.....	.....	13
14 Shelburne	55800	8825	.....	4700	1010	.....	126	.....	728	8100	5500	28	38	9652	26957	.....	.....	14
15 Yarmouth	111065	52600	125	97800	4985	.....	242	.....	377	3000	23750	163	3725	10750	1815	1050	.....	15
16 Digby	299685	3070	16	63800	.....	.....	.....	.....	10875	9340	17600	3636	37451	41065	11810	25760	.....	16
17 Annapolis	5890	1700	.....	.....	.....	650	.....	.....	.....	.....	.....	.....	.....	2760	845	410	.....	17
18 King's	6700	11100	8	.....	345	3920	.....	.....	1025	1000	.....	.....	24350	67	2929	16210	.....	18
Totals	1477415	164085	1070	566880	10292	27520	3232	1466	15984	806674	4315400	22274	83086	259901	81726	400953	193	8,259,085 28

*In No. 1, add \$16,060. †In No. 3, add \$4,500.

6-7 EDWARD VII., A. 1907

RECAPITULATION

OF the Yield and Value of the Fisheries of the whole of Nova Scotia for the Year 1905.

Kinds of Fish.	Quantity.	Rate.	Value.	Total Value.
		\$ cts.	\$ cts.	\$ cts.
Salmon, fresh..... Lb.	549,002	0 20	109,800 40	113,159 65
" preserved in cans..... "	6,755	0 15	1,013 25	
" smoked..... "	11,730	0 20	2,346 00	
Herring, salted..... Brls.	77,940	4 50	350,730 00	426,427 00
" fresh..... Lb.	5,055,240	0 01	50,552 40	
" smoked..... "	1,257,230	0 02	25,144 60	
Mackerel, salted..... Brls.	32,660	15 00	489,900 00	796,994 16
" fresh..... Lb.	2,559,118	0 12	307,094 16	
Lobster, preserved in cans..... Lb.	4,917,148	0 25	1,229,287 00	
" fresh in shell..... Cwt.	134,961	.....	1,119,467 00	2,348,754 00
Cod, dried..... "	482,533	4 50	2,171,398 50	
" fresh..... Lb.	417,000	0 03	12,510 00	
" tongues and sounds..... Brls.	951	10 00	9,510 00	2,193,418 50
Haddock, dried..... Cwt.	92,155	3 00	276,465 00	
" fresh..... Lb.	10,328,334	0 03	309,850 02	
" smoked (finnan haddies)..... "	2,632,350	0 06	157,941 00	744,256 02
Hake, dried..... Cwt.	132,942	2 25	299,119 50	
" sounds..... Lb.	65,755	0 50	32,877 50	
Pollock..... Cwt.	138,935	2 00	.....	331,997 00
Halibut..... Lb.	1,477,415	0 10	.....	277,870 00
Trout..... "	164,085	0 10	.....	147,741 50
Bass..... "	27,520	0 10	.....	16,408 50
Shad..... Brls.	1,070	10 00	.....	2,752 00
Alewives..... "	10,292	4 00	.....	10,700 00
Eels..... "	3,232	10 00	.....	41,168 00
Smelts..... Lb.	566,880	0 05	.....	32,320 00
Oysters..... Brls.	1,466	5 00	.....	28,344 00
Clams..... "	15,984	.....	.....	7,330 00
Flounders..... Lb.	806,674	.....	.....	32,216 00
Tom-cod..... "	315,400	.....	.....	29,379 90
Squid..... Brls.	22,274	4 00	.....	13,497 00
Coarse and mixed fish..... "	83,086	2 00	.....	89,096 00
Dogfish..... "	.....	.....	.....	166,172 00
Fish oil..... Galls.	259,091	0 30	.....	8,050 00
" as bait..... Brls.	81,726	1 50	.....	77,727 30
" as fertilizer..... "	400,953	0 50	.....	122,589 00
Seal skins..... No.	193	1 25	.....	200,476 50
				241 25
Total for 1905.....				8,259,085 28
Total for 1904.....				7,287,009 04
Increase.....				972,076 24

SESSIONAL PAPER No. 22

RECAPITULATION

Of the Capital invested in Fishing Vessels, Boats, Nets and other implements in all
Nova Scotia, for the Year 1905.

Number and Description of Articles.	Value.	Total.
	\$ cts.	\$ cts.
632 fishing vessels (24,369 tons).....	1,207,517 00	
14,772 " boats.....	364,665 00	
1,134 " dories.....	14,640 00	1,586,822 00
1,752,703 fathoms of gill-nets.....	640,220 00	
85,402 " seines.....	191,780 00	
220 trap-nets.....	79,880 00	
14,306 trawls.....	139,052 00	
84 weirs.....	15,010 00	
291 smelt-nets.....	5,365 00	
45,945 hand lines.....	38,271 00	1,109,428 00
237 lobster canneries.....	193,010 00	
591,770 " traps, &c.....	452,307 00	645,317 00
2 clam canneries.....	1,150 00	
293 fish freezers or ice houses.....	183,607 00	
4,893 smoke and fish houses.....	323,285 00	
2,079 fishing piers and wharfs.....	487,438 00	
415 " tugs and smacks.....	159,850 00	1,155,330 00
Total.....		4,496,897 00

Statement of persons engaged in the Fisheries of all Nova Scotia, 1905.

	No.
Men in fishing vessels.....	5,658
" boats.....	19,701
Persons in lobster canneries.....	5,420
Total.....	50,779

APPENDIX No. II

REPORT ON FISH-BREEDING OPERATIONS IN CANADA

1906

REPORT OF PROFESSOR EDWARD E. PRINCE, COMMISSIONER AND
GENERAL INSPECTOR OF FISHERIES FOR THE
DOMINION OF CANADA.

To the Honourable L. P. BRODEUR,
Minister of Marine and Fisheries,
Ottawa.

OTTAWA, October 15, 1906.

SIR,—I have the honour to submit my twelfth annual report upon the operations carried on in connection with the artificial propagation and transplantation of valuable kinds of fish, native to the waters of the Dominion. In my report last year, I made special reference to the remarkable expansion of the hatchery work under the auspices of the Dominion Government. I pointed out that, in a period covering the last thirty years, the number of hatching establishments had more than quintupled. As a matter of fact, with the new hatcheries whose erection is either completed or in an advanced state, the department has now no less than thirty-two institutions devoted to the important object of incubating the eggs of valuable species of commercial and game fish; and attached to many of them are rearing tanks and retaining ponds, where the young fish are cared for and protected until they are some months old, or, in certain cases, until one to three years old. The Lake Lester ponds, province of Quebec, have been operated successfully as before, while the black bass ponds, on the Bay of Quinte, near Belleville, yielded an ample supply of healthy young bass. One of the important features of the past season was the completion of the first shad hatchery, on the shores of the Bay of Fundy, near Windsor, N.S., while the selection and preparation of a new salmon retaining pond to replace the old-established tidal retaining pond for parent salmon, at Carleton, N.B., has been a matter of great moment in the fish-culture scheme carried out by the department. The retention of salmon, taken in June and July, mainly from the net fishermen, or from departmental fishing stations, and kept in tidal water until October and November when they are matured and ripe for purposes of artificial propagation, has been an unquestionable success. When the late Mr. Wilmot tried it for the first time at Tadousac, in 1875, grave doubts were expressed as to the ultimate success of the experiment, but the fish remained in the salt-water inclosure in perfect condition, and the plan was extended; and the well-known salmon-pond at the mouth of the St. John River, N.B., has been a most valuable and reliable means of supplying a number of hatcheries with an abundance of healthy salmon eggs. The new pond at St. John, will, it is hoped, prove as reliable as the old pond which was an invaluable adjunct to the hatchery system of the maritime provinces.

Last year the total output of fry of all kinds showed a grand total of 627,541,000, exclusive of the yield of young black bass and brook trout, and of lobsters hatched in the sea from the 52,772 'berried' or egg-barring female lobsters liberated from the Gabarus lobster ponds operated as explained in my last year's report by arrangement with Mr. H. E. Baker, a prominent Cape Breton lobster canner. This year the lobster ponds at Fourchu contained in the course of the season the total of 42,066 egg-bearing lobsters, and after the conclusion of the fishing season these lobsters were liberated in the open sea and their eggs were hatched by the parent fish under natural conditions; the young fry thus scattered over the areas off-shore, which are Nature's nursery for these minute crustaceans.

SESSIONAL PAPER No. 22

During the season of 1906 a grand total of no less than 653,052,000 fry of various kinds of fresh water and marine fishes were planted from the Dominion Government hatcheries.

The table which follows shows the various species of fish and the total number of each kind respectively hatched and successfully planted from the different establishments operated by the department, during the year.

Atlantic salmon (<i>Salmo salar</i>).....	11,705,000
B.C. salmon	78,025,000
Speckled trout (<i>Salvelinus fontinalis</i>).....	738,000
Salmon trout (<i>Salvelinus namaycush</i>).....	3,147,000
Grey trout (<i>Cristivoner namaycush</i>).....	437,000
Pickereel or Doré (<i>Stizostedion vitreum</i>).....	25,000,000
Lake whitefish (<i>Coregonus clupeiformis</i>).....	63,000,000
Lobster (<i>Homarus americanus</i>).....	471,000,000

Total..... 653,052,000

For facility of reference the detailed table below specifies the name and location of each hatchery, also the quantities of young fish and of eggs in an advanced condition supplied by each establishment respectively, and the species of fry or the kind of eggs so distributed during the season.

Number.	Name of Hatchery.	Number of Fry distributed.	Number of Eggs sent to other Hatcheries.	Species of fish.
1	Ottawa, Ont.	812,000	100,000	Salmon Trout.
	"	67,000		Gray Trout.
	"	120,000		Atlantic Salmon
	"	124,000		Speckled Trout.
2	Newcastle, Ont.	1,550,000		Salmon Trout.
3	Sandwich, Ont.	63,000,000		Whitefish.
	"	25,000,000		Pickereel.
4	Gaspé, P. Q.	1,100,000		Atlantic Salmon.
5	Tadoussac, P. Q.	2,435,000		" "
6	Lac Tremblant.	555,000		Salmon Trout.
7	St. Alexis, P. Q.	493,000	150,000	Speckled Trout.
8	Magog, P. Q.	165,000	250,000	Salmon Trout.
	"	70,000		Speckled Trout.
	"	370,000		Gray Trout.
	"	20,000		Atlantic Salmon.
9	Bedford, N.S. *.	1,000,000		" "
	"	51,000		Speckled Trout.
	"	20,000		Salmon Trout.
	"	910,000		Atlantic Salmon.
10	Margaree, N.S.	575,009		" "
11	Windsor, N.S.	118,000,000		Lobsters.
12	Bay View, N.S.	71,000,000		" "
13	Canso, N.S.	1,650,000	650,000	Atlantic Salmon.
14	Miramichi, N.B.	1,575,000		" "
15	Restigouche, N.B.	45,000		Salmon Trout.
	"	1,350,000		Atlantic Salmon.
16	Grand Falls	122,000,000		Lobsters.
17	Shemogue, N.B.	70,000,000		" "
18	Shippegan, N.B.	90,000,000		" "
19	Charlottetown	720,000		Atlantic Salmon.
20	Kelly's Pond			Whitefish.
*21	Selkirk, Man.			" "
*22	Berens River, Man.			B. C. Salmon.
23	Fraser River, B.C.	9,130,000		" "
24	Granite Creek, B.C.	10,888,000	4,500,000	" "
25	Skeena River, B.C.	3,784,000		" "
26	Harrison Lake, B.C.	28,773,000		" "
27	Nimkish, B.C.	4,873,400		" "
28	Pemberton, B.C.	17,450,000	8,833,000	" "
29	Rivers Inlet, B.C.	8,000,000		" "

* Not in operation last year.

6-7 EDWARD VII., A. 1907

FISH-

Statement showing the places where and the years in which the Dominion fish establishment annually since the commencement

Number.	YEAR.	ONTARIO.			QUEBEC.		
		Newcastle.	Sandwich.	Ottawa.	Magog.	Tadousac.	Gaspé.
		Fry.	Fry.	Fry.	Fry.	Fry.	Fry.
1 1868-73.....		1,070,000					
2 1874.....		350,000					
3 1875.....		650,000				60,000	110,000
4 1876.....		700,000	8,000,000			150,000	50,000
5 1877.....		1,300,000	8,000,000			1,180,000	1,051,000
6 1878.....		2,605,000	20,000,000			707,000	650,000
7 1879.....		2,602,700	12,000,000			1,250,000	1,597,000
8 1880.....		1,923,000	13,500,000			1,155,000	730,000
9 1881.....		3,300,000	16,000,000		200,000	334,000	500,000
10 1882.....		4,841,000	44,000,000		975,000	660,000	530,000
11 1883.....		6,053,000	72,000,000		250,000	995,000	520,000
12 1884.....		8,800,000	37,000,000		100,000	985,000	859,000
13 1885.....		5,700,000	68,000,000		300,000	720,000	290,000
14 1886.....		6,451,000	57,000,000		1,400,000	1,627,000	576,000
15 1887.....		5,130,000	56,500,000		675,000	900,000	630,000
16 1888.....		8,076,000	56,000,000		3,475,000	850,000	800,000
17 1889.....		5,846,500	21,000,000		2,800,000	1,600,000	450,000
18 1890.....		7,736,000	52,000,000	5,732,000	2,875,000	1,700,000	806,000
19 1891.....		7,807,500	75,000,000	7,043,000	3,050,000	1,300,000	1,000,000
20 1892.....		4,823,000	44,500,000	4,909,000	2,400,000	624,000	963,000
21 1893.....		9,835,000	68,000,000	6,208,000	3,600,000	2,060,000	910,000
22 1894.....		6,000,000	47,000,000	4,480,000	2,035,000	1,975,000	850,000
23 1895.....		6,000,000	73,000,000	3,210,000	3,350,000	2,060,000	675,000
24 1896.....		5,200,000	61,000,000	3,950,000	3,400,000	2,500,000	300,000
25 1897.....		4,200,000	72,000,000	4,100,000	4,500,000	3,272,000	1,100,000
26 1898.....		4,325,000	71,000,000	3,020,000	3,100,000	2,200,000	
27 1899.....		4,050,000	73,000,000	3,700,000	3,098,000	2,125,000	
28 1900.....		5,175,000	90,000,000	3,450,000	3,099,000	1,400,000	
29 1901.....		5,900,000	67,000,000	3,410,000	3,135,000	2,960,000	
30 1902.....		650,000	100,000,000	1,245,000	935,000	2,730,000	734,000
31 1903.....		2,500,000	90,000,000	1,201,000	885,000	1,625,000	830,000
32 1904.....		1,475,000	75,000,000	877,000	283,000	2,615,000	1,520,000
33 1905.....		1,480,000	106,000,000	1,103,000	1,098,000	1,550,000	1,100,000
34 1906.....		1,550,000	88,000,000	1,123,000	875,000	2,435,000	1,100,000
Totals		144,104,700	1,741,500,000	58,761,000	51,893,000	48,274,000	21,233,000

SESSIONAL PAPER No. 22

BREEDING.

hatcheries have been erected ; also the number of fry distributed from each of operations, including the year 1906.

QUEBEC— <i>Con.</i>		NEW BRUNSWICK.					Number.
St. Alexis des Monts.	Mont Tremblant.	Restigouche.	Miramichi.	St. John River.	Lobster Hatchery, Shemogue.	Lobster Hatchery, Shippegan.	
Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	
.....	100,000	60,000	.....	.....	.....	1
.....	600,000	150,000	.....	.....	.....	2
.....	300,000	60,000	.....	.....	.....	3
.....	600,000	320,000	.....	.....	.....	4
.....	1,015,000	665,000	.....	.....	.....	5
.....	1,470,000	1,025,000	.....	.....	.....	6
.....	1,500,000	805,000	170,600	.....	.....	7
.....	740,000	770,000	50,000	.....	.....	8
.....	1,400,000	640,000	588,000	.....	.....	9
.....	300,000	925,000	72,600	.....	.....	10
.....	940,000	795,000	811,000	.....	.....	11
.....	660,000	900,000	155,000	.....	.....	12
.....	1,380,000	945,000	2,181,000	.....	.....	13
.....	1,500,000	900,000	2,479,000	.....	.....	14
.....	1,720,000	1,290,000	4,142,000	.....	.....	15
.....	1,280,000	850,000	3,570,000	.....	.....	16
.....	2,396,000	1,022,000	3,492,000	.....	.....	17
.....	1,750,000	1,503,000	3,165,000	.....	.....	18
.....	1,240,000	1,310,000	2,378,000	.....	.....	19
.....	883,000	975,000	3,299,000	.....	.....	20
.....	1,080,000	1,010,000	4,096,000	.....	.....	21
.....	2,885,000	1,200,000	4,060,000	.....	.....	22
.....	1,250,000	1,430,000	4,068,000	.....	.....	23
.....	2,100,000	1,558,000	4,155,000	.....	.....	24
.....	1,135,000	1,557,000	3,290,000	.....	.....	25
.....	2,025,000	1,605,000	3,980,000	.....	.....	26
.....	1,125,000	1,620,000	3,957,000	.....	.....	27
.....	1,750,000	1,800,000	3,605,000	.....	.....	28
.....	2,310,000	1,700,000	998,000	.....	.....	29
.....	2,052,000	1,000,000	648,000	17,000,000	.....	30
.....	2,525,000	1,500,000	909,000	52,000,000	50,000,000	31
125,000	2,333,000	1,400,000	807,000	100,000,000	100,000,000	32
298,000	570,000	1,620,000	1,650,000	1,350,000	122,000,000	70,000,000	33
493,000	555,000	.....	.....	.....	.....	.....	34
916,000	1,125,000	45,964,000	34,940,000	62,476,000	291,000,000	220,000,000	

6-7 EDWARD VII., A. 1907

FISH-

STATEMENT showing the Places where and the Years in which the

Number.	YEAR.	NOVA SCOTIA.						P. E. ISLAND.	
		Bedford.	Sydney.	Margaree.	Wind-sor.	Lobster Hatchery Bay View.	Canso.	Kelly's Pond.	Lobster Hatchery, Charlottetown
		Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.
1 1868-73.									
2 1874.									
3 1875.									
4 1876.	395,000								
5 1877.	1,000,000								
6 1878.	1,400,000								
7 1879.	1,740,000								
8 1880.	730,000								
9 1881.	680,000								500,000
10 1882.	850,000	315,000							375,000
11 1883.	800,000	659,000							1,000,000
12 1884.	1,000,000	853,000							1,210,000
13 1885.	670,000	772,000							1,000,000
14 1886.	950,000	1,179,000							1,100,000
15 1887.	4,230,000	1,415,000							400,000
16 1888.	4,390,000	1,559,000							500,000
17 1889.	3,850,000	2,034,000							Output of
18 1890.	3,860,000	1,953,000							Dunk R.
19 1891.	2,550,000	1,000,000				7,000,000			Hatche-
20 1892.	2,620,000	690,000				63,500,000			ry, now
21 1893.	3,180,000					153,600,000			closed.
22 1894.	3,805,000	288,000				160,000,000			
23 1895.	3,815,000	195,000				168,200,000			
24 1896.	4,225,000	243,500				100,000,000			
25 1897.	5,450,000	496,000				90,000,000			
26 1898.	3,000,000					85,000,000			
27 1899.	4,025,000					100,000,000			
28 1900.	3,970,000					120,000,000			
29 1901.	3,980,000					110,000,000			
30 1902.	960,000			95,000		120,000,000			
31 1903.	710,000			600,000		164,000,000			
32 1904.	1,213,000			562,500		175,000,000			60,000,000
33 1905.	800,000			799,500		155,000,000	8,000,000		100,000,000
34 1906.	1,071,000			910,000	575,000	118,000,000	71,000,000	720,000	90,000,000
		71,999,000	13,651,500	2,967,000	575,000	1,889,300,000	79,000,000	720,000	256,085,000

SESSIONAL PAPER No. 22

BREEDING.

several Fish Hatcheries have been erected, &c.—*Concluded.*

BRITISH COLUMBIA.							MANITOBA.	TOTALS.	Number.
Fraser River	Harrison Lake.	Granite Creek, Sicamous.	L. Lakelse Skeena River.	Pember-ton.	Rivers Inlet.	Nimpkish River.	Selkirk.		
Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	
								1,070,000	1
								510,000	2
								1,570,000	3
								9,655,000	4
								13,451,000	5
								27,042,000	6
								21,684,700	7
								21,013,600	8
								22,949,000	9
								55,799,000	10
								83,784,600	11
								53,143,000	12
								81,067,000	13
1,800,000								76,714,000	14
2,625,000								79,278,000	15
4,414,000								88,109,000	16
5,807,000								47,699,500	17
4,419,000								89,212,000	18
6,640,000								115,772,300	19
3,603,800								135,959,500	20
6,000,000								258,314,000	21
5,764,000								14,500,000	22
7,800,000								19,000,000	23
6,390,000								4,500,000	24
10,393,000								254,919,000	25
5,928,000								294,040,000	26
5,850,000								202,459,500	27
4,742,000								198,859,000	28
6,200,000								9,000,000	29
								20,000,000	30
								32,000,000	31
								271,996,000	32
								203,540,000	33
9,214,000		6,760,000						23,000,000	34
9,573,000		4,866,500	3,450,000			1,636,000		12,000,000	35
6,584,000		3,074,000	4,000,000			2,496,000		31,500,000	36
2,550,000	6,505,000	4,000,000	3,767,900			2,800,000		25,500,000	37
9,130,900	28,775,000	10,888,000	3,784,000	17,450,000	8,000,000	4,873,400		657,925,400	38
125,426,800	35,278,000	29,588,560	15,001,900	17,450,000	8,000,000	11,805,400	191,000,000	5,470,035,000	39

6-7 EDWARD VII., A. 1907

Further details as to the working of each hatchery will be found in Superintendent F. H. Cunningham's report, which follows my present report. Mr. Cunningham has been very fully engaged in visiting sites suggested for new hatcheries, in arranging for the erection of other hatcheries which have been authorized, and in inspecting a considerable number of the hatcheries while in the midst of their operations. With the continued growth of the fish-breeding system in all parts of the Dominion, it has become impossible to inspect and supervise the various institutions as frequently as is desirable, hence it became necessary to appoint a special officer, Mr. Alexander Finlayson, to perform these imperative duties. I have on several occasions adverted to the services of Mr. Finlayson, and the exceptional qualifications which he possesses in the field of artificial fish-culture, and in the work of regular hatchery inspection, the department will be enabled to keep in more direct touch with the various hatching establishments and the officers in charge and the staffs under them.

For many years the only regular inspection was on the occasion of my systematic tours as Dominion Fisheries Commissioner to the different fishing localities in the most diverse parts of the Dominion. I visited in the course of my official tours every hatchery in operation, but as year after year new buildings were erected any regular inspection became very difficult. With Mr. Cunningham as Superintendent and Mr. Finlayson as Inspector, the necessary supervision will be more effectively accomplished. I took the opportunity while visiting all parts of the British Columbia coast and the upper waters of certain salmon rivers during the past summer, to visit every Dominion hatching establishment on the Pacific coast. I have visited the Bon Accord, Fraser River hatchery, and the establishments at Harrison Lake; Pemberton Meadows, Birkenhead River; Granite Creek, Shuswap Lake, Nimpkish River, near Alert Bay; the remote hatchery at Lakelse Lake, on the Skeena River; and the fine building at O-Wee-Kay-No Lake, Rivers Inlet, the last-named being visited indeed twice, viz., in December last, and again, in July. It is with very great satisfaction that I am able to report most favourably on all these hatcheries. The department is fortunate in having, at each of the institutions referred to, officers in charge of exceptional ability. I found each one intensely interested in his work, work often very arduous and always very responsible, and enthusiastic in producing the best results without excessive expenditures. The residents in the various localities spoke most highly to me about these officers; and about the staffs of assistant officers, employed in the different branches of hatchery work, under the direction of the officers in charge. Some of the hatcheries are situated in places very isolated and remote, where only officers conscientious and enthusiastic in the extreme could be relied upon to produce the splendid and successful results, which I am able to record in my present report. Further, in some of the isolated hatcheries, especially near the head-waters of great rivers, like the chief salmon rivers of British Columbia, the hatchery buildings must be located on sites which, at times, are in danger of mountain slides, or of gigantic freshets and floods. The dams and retaining inclosures, necessary for supplying water, or relieving the overcrowded tanks in the hatchery, are imperilled each season from January to June. It is an important question whether or not hatcheries should not, in all cases, be built in accessible situations, so that the eggs may be brought down from the upper spawning grounds, and the newly hatched fry shipped by scow or canoe, before the spring floods, up to the nearest tributaries or suitable portions of the main river. The young of the various species of Pacific salmon do not remain many months in the upper waters before they descend to the sea, hence it is not material to transport them from the hatcheries to the highest sources of their native rivers. The most important species of B.C. salmon, as is well known, viz., the sockeye or blueback, is hatched, as a rule, in small streams which empty into more or less spacious lakes, and rarely in the main channel of rivers, though I know of many exceptions, and have seen sockeye salmon breeding in creeks which were almost tidal in character, so near to the sea was the source of the stream chosen by the spawning schools. It is hardly necessary to add that in case of an accident or a breakdown, or in case of illness amongst the staff, the results, in the remotely situated hatcheries to which I am making reference, might be very serious. Cases are on the department's records of such mishaps, which are inevitable at times, and only the skill and foresight

SESSIONAL PAPER No. 22

of the officer in charge has prevented disaster. Two cases have come to my notice in the Dominion hatcheries recently, in which it was only by efforts almost superhuman that the officers in charge averted loss of fry and injuries to the hatcheries under their care, and had the officers in question not remained continuously at work for two or more days and nights in succession, the results would have not only been unfavourable, but possibly disastrous.

These observations upon the location of hatcheries, and the desirability of selecting accessible locations rather than distant and remote sites, brings up the allied question, 'should fry be always planted on, or close to, the natural spawning areas?' If so, it is clear that hatcheries must be located near the grounds in question. To convey fry from even some of the existing hatcheries, placed as near as may be to the breeding grounds, is, as many of our officers in charge are well aware, a most laborious and difficult task. It has been insisted that young fry should not only be carried up to the highest possible shallow areas, but they should be scattered thinly or 'sown' so that they may not crowd or be massed too numerous together. The fact cannot be ignored that, by a law of nature which it is impossible to overcome, unless by exceptional and often difficult measures, a certain proportion of young fishes are destined to be the food of aquatic animals, birds, &c., and the retention of the small fish until they attain some size, will not save them from that toll which nature provides should be paid by one class of living creatures to other living animals. The fish-culturist must face the fact that a proportion of liberated young fish will inevitably succumb to the conditions of fish-life in the rivers and the sea. One of these conditions being, that small fishes are the natural food of other creatures, including the finny tribes themselves. I have so often, in former reports, dwelt upon the advantages secured by the adoption of the methods of artificial fish-breeding, that I need only refer to the gain which is secured by saving the defenceless eggs from that terrible decimation which they suffer when placed by the parents upon the natural hatching ground. I may quote from my special report, of which a revised reprint, much extended, was published in the department's (Fisheries) report last year:—

'It is plain that if we can secure the eggs from the ripe parent fish and hatch them under the care of experts, the results must infinitely surpass those possible under natural conditions, where a small proportion only can be expected to surmount all the dangers and difficulties of their environment. Let me give an illustration of this waste of eggs on the natural spawning beds—a waste not contrary to natural law, but obedient to the principle of compensation and adjustment, universal in the world of nature. In 1895 I spent some time closely observing certain spawning beds of the Fraser river salmon, commonly called sockeye or blueback. I noticed, not once, but scores of times, pairs of fish busy nesting, the male fish lingering near his partner until she shed a shower of eggs. Just as the eggs were cast into the rapid stream, the male fish had his attention attracted by a rival, and darted with lightning speed to drive him off, both male fish tearing at each other with gaping jaws, armed with formidable teeth, the teeth at this time being of abnormal size. Time after time I saw female fish wasting their eggs in this way, for the eggs deposited in the gravel by the female, while her partner was engaged in a fight twenty or thirty yards away, were unfertilized and would, of course, perish or be eaten by hungry enemies, suckers, trout, &c., which hovered near in hordes.

This loss of naturally spawned eggs is universally admitted, but the crowding on the spawning grounds, or 'redds' as they are called in Britain, proves injurious to the fish, as the fungoid growth, which is so terrible a disease, is transferred from one to the other, if indeed this crowding is not the original cause of the disease. The first great destruction takes place on the 'redds.' Everywhere over these are tiny raised heaps of gravel sheltering the spawn, but the shelter is insufficient to guard it from devouring enemies. These are in the air, on the land, in the water. Many members of the hungry salmonide themselves prey on the spawn, and it is difficult to cope with them. Bunches of wild duck and teal seek out the 'redds' in the autumn, and feed on right through the night if not disturbed. Here too, as frequently witnessed, the swan leads her cygnets, and it is known that one of these large birds will destroy nearly a gallon of ova in a day.

6-7 EDWARD VII., A. 1907

If, to the natural loss of enormous quantities of eggs by non-fertilization, be added the depredations of ducks, loons, herons and aquatic birds, not to speak of otters and four-footed enemies, as well as destruction by floods, by mud, gravel and ice, it is easy to see how great are the advantages offered by artificial incubation, and by caring for the eggs in properly equipped hatcheries.'

It is not sufficient merely to select the head waters, or even the shallow natural resorts of such fish as the young of the salmon, but to plant the product of the hatcheries in waters where the minimum of risk to the young fry can be secured. The sowing or scattering of the fry thinly, over gravelly shallows, will not by any means ensure their safety and there are authorities who favour the planting of large batches of newly-hatched fish in fairly deep water, placing reliance on the instinct of the young in scattering widely, and distributing themselves upon the nearest accessible shallows, in lakes or streams. Young fish certainly do scatter and dissipate in the most amazing manner when planted. They melt away, as it were, before the eyes of the hatchery officers, and close examination a few hours later will reveal to a trained eye the minute, almost invisible, little creatures hiding in interstices between pebbles and boulders, safe from the detection of wandering enemies.

The principal risks to which young fish are exposed, when planted on shallow flats in-shore, as usually recommended, may be summarized as follows:—

(1). Floods and freshets may smother them or sweep them over swampy overflowed fields where they may be stranded and lost. In the deeper main streams this will be less likely to happen.

(2). Frost and floating ice may kill them, as they lie in the gravelly shallows.

(3). Ducks and aquatic animals, especially water beetles, and insect larvæ, which are most destructive to small helpless fish, can detect and prey upon them, when only partially hidden along the sides of lakes or streams.

(4). In dry seasons the fry may be left exposed to drought, or may be cut off altogether from the safety of the main river channel. I have twice during the past summer found schools of valuable fish, of small size, thus cut off and doomed to perish as the water receded. With a small-meshed landing net I cleaned the pools of the imprisoned fish, and carried them to the main channel where they were secure from the fate which otherwise would inevitably have come upon them. In one of these cases the pool, which was almost entirely dried up, contained the young of not fewer than nine species of fish, some of them in considerable numbers, like the small black bass, and doré or pickerel.

The details of the work accomplished in the various hatcheries will be found, as usual, in the several reports of the officers in charge. The report of the Superintendent of Fish-Culture (Mr. F. H. Cunningham), which follows my present report, affords information, summarized, of the hatching ponds, and other fish-propagation methods, in addition to a concise statement of the work of the hatcheries since the report of last season.

I have the honour to be,

Your obedient servant,

EDWARD E. PRINCE,

Commissioner of Fisheries and General Inspector of Fisheries for Canada.

ANNEX A.

OTTAWA, October 30, 1906.

To Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—Owing to the general success which has attended the operations at the various fish-breeding establishments under the direct control of this department throughout the Dominion, it affords me great pleasure to offer this report on fish-culture for the past year.

One of the most valuable assets of the Dominion is its fisheries, which last year amounted to over twenty-nine millions of dollars, such vast resources forming a national food supply must be husbanded and nature assisted as far as possible by a careful extension of fish breeding operations at such points that offer the necessary facilities for extending the same.

HATCHERY SITES.

The selection of a suitable site is the initial and most important factor of the work. Not only must a supply of pure water be available at all times, but the spawning grounds should be within a reasonable distance of the location. Whilst this remark refers generally, it is perhaps more applicable to British Columbia where it is found that the Pacific salmon will not survive in confinement to the same extent as the Atlantic salmon, hence it becomes necessary that the locations for hatcheries on the Pacific coast must be even nearer the spawning grounds than is actually necessary in the east, which means the erection of hatcheries far up the streams and as very often happens in isolated places, hard to reach and expensive to maintain. The question arises, why not locate the hatcheries in more convenient places and transport the eggs and fry to and from such points. This could be done providing navigation would allow; but unfortunately for the system in British Columbia the streams are so rapid that the reaching of even the spawning beds nearest the mouths of the rivers would be a very expensive and hazardous undertaking.

Again, the sockeye salmon, with few exceptions, are not ripe for spawning purposes until they reach the upper waters of the rivers, which, as a rule would mean the transporting of green eggs long distances by water and over rough trails before reaching the hatchery. This would of necessity entail a heavy mortality in the eggs, so that the inconvenience, isolation and extra cost of maintenance is more than balanced by the larger number of fry that can be produced from a given quantity of eggs by having the establishment near the spawning and distributing point.

RETAINING PONDS.

The system followed by the department some years ago in securing parent salmon for eastern hatcheries was by sweeping the upper reaches of the rivers at about the spawning time. This method was discontinued and a retaining pond established by the late Superintendent of Fish Culture, Mr. S. Wilmot, in the harbour of St. John. From this pond, which would accommodate about fifteen hundred salmon from May to November, it was intended to fill as many of the lower province hatcheries as possible. This scheme has proved very successful.

The parent fish are purchased directly from the commercial catch, placed in the pond and after being spawned are released to return to the salt-water. A number of the fish so retained were marked before being released each year and during the past season a number of these fish have been again captured.

Owing to sewerage pollution it became necessary to select a new site for the retaining pond this season, and as an experiment Little River is being used for this purpose. The ultimate success of the selection can only be determined after the spawning operations are completed this fall.

The question of establishing retaining ponds for parent fish at such of the hatcheries as afford the necessary facilities has been laid before the department on several occasions: but the convenience of travelling in all directions, both by rail and water, from St. John, enables the one general pond to, as a rule, supply the requirements of the eastern hatcheries.

REARING PONDS.

This is a phase of fish culture that might well be extended to such points which afford the necessary facilities, in fact some ingenuity on the part of the officers in charge would make this possible on a small scale at the most of the hatcheries, especially where the waters do not reach too high a temperature. While it would be too costly to attempt this work on a large scale, it might be stated that at Restigouche, N.B., a fair-sized pond for the retaining of salmon until they are four months old has proved very successful, and at Newcastle and Ottawa, Ontario, it is also being done on a smaller but very successful basis.

COLLECTION OF OVA.

This is a matter that requires the most careful and untiring efforts of all the officers connected with the Fish Cultural work in the Dominion. On the efficient performance of this most important detail hinges the success or failure of a season's operations. The greatest care and attention must be given to the proper impregnation of the egg, as it is this first step that makes or mars the operations. It is reasonable to attribute even the comparative small percentage of loss at the Dominion hatcheries to the too hasty performance of this detail, and the necessity for the greatest of care in attending to the proper impregnation of the egg cannot be too strongly impressed upon the officers having charge of this work.

Whilst the object desired by all is to fill the respective institutions to their full capacity, still this should not be accomplished at the sacrifice of a large number of eggs which will most assuredly result if the eggs have not been properly fertilized. While on this question and coupled with the numerous public demands for the establishment of additional hatcheries the serious question of spawning beds arises. Where is the large supply of eggs required for hatchery purposes to be secured? This is a phase of the question that does not enter the public mind, but it is a great source of concern to the officers of the department.

There are salmon and salmon trout hatcheries throughout the Dominion to be provided for and when considering the question, it will be easily understood why anxious moments are often experienced by the officers connected with this service. The time has arrived when attention must be given to the providing of a departmental lake for the retention of salmon trout from which the department can always rely for securing a full supply of eggs of this species. To accomplish this a suitable lake should be selected, cleaned of all other predaceous species and stocked with salmon trout. This will cost money, but resources showing a value of twenty-nine millions of dollars annually are worthy of being fostered.

DISTRIBUTING FRY.

In my report of last year, reference was made to the stocking of lakes by localities instead of planting small quantities of fry over widely scattered areas. This suggestion

SESSIONAL PAPER No. 22

has been followed to a small extent, but the system of 'Applications for Fry' makes it difficult to carry out as fully as could be wished; but it is again strongly recommended that this system of distributing be extended as occasion offers.

Reference must be made to the impossibility of supplying applications for speckled trout fry. It is not possible to secure eggs from this species in large quantities, and the planting of these fry should be limited to only such public waters as have been entirely depleted.

ONTARIO.

Newcastle Hatchery.

The operations at this premier hatchery of the Dominion have again been successful. These are confined to the hatching of salmon trout, the eggs being secured in Colpoy's bay, Georgian bay. A small bass pond is also operated in connection with this institution. The rearing of fingerling salmon trout on a small scale has also been very successful.

Ottawa Hatchery.

As stated on previous occasions, this hatchery while turning out large quantities of fry is more of an experimental station at which fry of the various species are reared in the aquaria and their habits noted.

Whilst speckled trout have been incubated at this establishment it is not considered advisable to continue hatching this species at this institution, as owing to the high temperature of the water the eggs hatch prematurely, which causes considerable loss. During the past year some eighteen thousand persons visited this establishment.

Sandwich Hatchery.

At this institution whitefish and pickerel are the only species handled. Last year some sixty-three millions of whitefish and twenty-five millions of pickerel were distributed from this establishment.

Bass Ponds, Bay of Quinte.

It appears that the applications for small-mouthed black bass are increasing each year, so much so that it is impossible to commence to fill them all. The hatching of bass in artificial ponds has proved successful, and the work might well be extended at such points as offer the necessary facilities, bearing always in mind the danger, if great care is not taken, that these predaceous fish are not introduced into trout lakes, which would mean the extermination of the trout. On this account applications for bass should be inquired into closely as one planting of bass would create loss and endless trouble.

The past year's operations have been very successful and some fine specimens of young bass are now being distributed.

QUEBEC.

Gaspé Hatchery.

This establishment is devoted entirely to the hatching of Atlantic salmon, the eggs being procured from the salmon retaining pond at St. John, N.B. The operations for the past year have been successful and the fry have been distributed in rivers adjacent to the hatchery.

Tadousac Hatchery.

This hatchery has again experienced another successful season and over two millions of salmon fry were distributed. A subsidiary hatchery was last season erected on the

6-7 EDWARD VII., A. 1907

Ste. Marguerite river, which was necessary as a means of stocking this stream. It obviates the necessity of conveying the young fry to a river difficult of access which was in the past a very hazardous undertaking.

Magog Hatchery.

This hatchery was last season largely filled with gray trout eggs, taken in Lake Memphremagog, and salmon trout eggs from Georgian bay. Some speckled trout from the St. Alexis waters were also successfully incubated. Waters of the Eastern Townships are now showing beneficial results from this institution. It might be mentioned that sea salmon planted in Lake Memphremagog have been caught by fly-fishing during the season just closed. In addition to the quantity of fry distributed from this hatchery to the various waters named in the report of the officer in charge, some two hundred and fifty thousand fry were transferred to the rearing ponds at Lake Lester.

St. Alexis Hatchery.

This hatchery is almost entirely devoted to the hatching of speckled and marstoni trout but some sea salmon are also incubated, and those distributed last season appear to be thriving. Great difficulty is experienced in securing the trout eggs, owing to the almost inaccessible location of the hatchery, but in the face of these difficulties the required number were secured last year and a successful season resulted.

Lake Lester Rearing Ponds.

The success attending the establishment of rearing ponds on this lake has surpassed all expectations. Last season some two hundred and fifty thousand fry of the various species were held in the ponds until they averaged from three to four inches in length, when they were distributed. At the present time some two hundred and fifty thousand fry are doing remarkably well. The success of these rearing ponds may safely be attributed to the ample supply of spring water and the careful attention paid to the fry by the officer in charge.

Lac Tremblant Hatchery.

On Lac Tremblant a small hatchery for the stocking of this and adjacent waters has been in operation for the past two years. Salmon trout with a small proportion of speckled trout are the principal species handled. The operations last season were successful, and this season an effort will be made to secure some trout fry from local waters.

NOVA SCOTIA.

Bedford Hatchery.

This establishment is supplied with salmon eggs from the retaining pond at St. John, N.B. A few speckled trout eggs have been incubated, but it is advisable that the work at this hatchery should be almost entirely in the direction of assistance to the salmon fisheries. Very gratifying reports have been received from different points in the province on the splendid results accruing from the stocking of rivers from this hatchery.

Margaree Hatchery.

Last season's operations at this hatchery were very successful and the salmon rivers in which fry have been planted are said to already be showing the beneficial results of establishing this institution. Over nine hundred thousand healthy salmon were last season distributed in Margaree, Little, Middle and Baddock rivers. The eggs for this establishment are provided from the St. John Pond and, notwithstanding

SESSIONAL PAPER No. 22

the fact that the Margaree hatchery is a difficult point to reach with green eggs, the results show that with care in packing and handling the eggs the percentage of loss is no greater than at other hatcheries.

Windsor Hatchery.

Last season was the initial one at this institution and the expectations for successful operations, as mentioned in my last report, have been realized and five hundred and seventy-five thousand salmon fry were planted in the waters of Hants, King's and Colchester counties. At this establishment a small plant for the hatching of shad was installed. The task of securing the shad eggs was entrusted to one of the most efficient officers in the service, but owing to the extremely delicate formation of the shad egg, transportation and the high temperature of the water available, the experiment was not as successful as could be wished. The eggs hatched and premature fish were the result. The eggs were secured in the Nictaux river and another season it will be necessary to erect a temporary structure for hatching these fish at the point at which they are secured. The delicate fibre of the egg will not stand transportation. This is the first time that the hatching of shad eggs has been attempted in Canada and whilst the results were not successful in the quantity of fish hatched, a great deal of experience was gained which will be of benefit for future operations in this direction.

Lobster Hatcheries.

The institutions in this province for hatching lobsters are located at Bay View and Canso. The past season was not as successful in point of numbers as heretofore, owing to the stormy weather and prevailing high winds, which kept the lobsters off the coast as well as preventing the fishermen from attending regularly to their traps.

NEW BRUNSWICK.

Restigouche Hatchery.

The operations at this establishment during the past season have been most satisfactory. The majority of the salmon eggs are procured from fish captured under departmental supervision whilst they are ascending the Restigouche river, the balance required being supplied from the retaining pond at St. John. The rearing pond in connection with this establishment is most favourably commented upon. At the present time some fifty thousand young salmon hatched last spring are now in this pond and will be distributed later on in the season.

Miramichi Hatchery.

This hatchery has been doing excellent work for many years and the salmon rivers adjacent thereto afford large returns to both the actual fishermen and the angler. This building was erected as far back as 1874, and no large expenditure has been made on repairs since that time. For several years past the department has appreciated the necessity for extensive repairs and alterations at this place, but the needs of other places where no fish breeding operations were conducted were so pressing that such alterations were postponed from year to year, until now repairs are an actual necessity and action in this direction is now engaging the attention of the department. It will be noticed in the report from the Officer in Charge (Mr. Isaac Sheasgreen) that, following the suggestions made in my report of last year on the distribution of fry, more attention has been paid to the main streams, in which quantities of fry have been placed, instead of carrying them long distances in wagons over rough roads to the smaller tributaries. In this way the work of distribution has been accomplished at a largely reduced expenditure and the results should prove just as beneficial.

St. John River Hatchery.

Last year reference was made to the extensive repairs that were imperative at this establishment before another season's work could be commenced. These repairs

6-7 EDWARD VII., A. 1907

are now under way and will be completed before the time arrives for placing the eggs in the troughs this fall. The operations last season were satisfactory, some one million three hundred thousand salmon eggs being distributed from this establishment.

Salmon Pond, Little River.

Reference has already been made to the necessity for abandoning the old site used as a retaining pond in St. John harbour. It is not an easy matter to find a place suitable in all respects for this purpose, and after careful inspection Little river was chosen as offering what appeared to be the most suitable facilities for the location of a pond, and temporary arrangements were made for trial of one year before any permanent work was effected. Whilst answering the purpose it has not proved ideal and another site more affected by the ebb and flow of the tide would be more suited to the purpose. It might be here explained that the fish retained in this pond are purchased direct from the commercial fishermen, who perhaps do not thoroughly appreciate the necessity for the utmost care being taken in handling salmon designed for retention in a comparatively fresh water pond. Any abrasion that may occur will not heal on salmon retained in a comparatively small area of fresh water reaching a high temperature, whilst in a pond affected by the tide to a greater extent than the one here alluded to such abrasions will heal in a fairly short time.

Lobster Hatcheries.

The lobster hatcheries in New Brunswick are located at Shemogue and Shippegan. The same remarks made on the Nova Scotia institutions apply here. The rough weather and high winds prevented the collection of as large a quantity of eggs as was hoped for, but those that were secured were successfully incubated, and the young lobsters were distributed in a healthy condition.

PRINCE EDWARD ISLAND.

Kelly's Pond Hatchery.

The season just closed was the initial one at this institution. The operations resulted in the distribution of seven hundred and twenty thousand salmon. This season efforts will be made to secure some sea trout eggs and arrangements in this direction are now being made.

Lobster Hatchery.

The hatchery for this purpose is located at Blockhouse Point, Charlottetown harbour. Similar reports to those received from Nova Scotia and New Brunswick have also come to hand from this institution. Spawn lobsters are reported as being limited in number but such eggs as were procured hatched out in splendid condition, the result being the distribution of forty millions of healthy and thriving young lobsters.

MANITOBA.

The two hatcheries for the incubation of whitefish located on Lake Winnipeg were not in operation last season, the cause being such an early closing of navigation on this lake, that it was impossible to convey the eggs to the hatchery. Full reports from the officers having this work in hand were embodied in my last year's report. It is hoped and expected that the coming season will see both of these institutions running to their full capacity.

BRITISH COLUMBIA.

In my report of last year, reference was made to the fact that a competent officer had been placed in charge of each one of the hatcheries in this province, who is held responsible directly to the department at Ottawa instead of to the Inspectors of Fisheries. This change in the system is working well and the service is as easily and as efficiently operated as in the eastern provinces.

SESSIONAL PAPER No. 22

Harrison Lake Hatchery.

This is the largest and best equipped institution in Canada, and thirty millions of eggs can be handled each season if it is possible to secure them. Last season twenty-eight million seven hundred thousand young salmon were released from this establishment. The work of capturing parent fish for the current season's operations is now under way.

Rivers Inlet Hatchery.

Last year, the opening season operations were successfully conducted at this hatchery by Mr. Wm. Roxburgh, the officer in charge. Great difficulties were encountered, but a successful distribution of eight millions of salmon fry is the gratifying result of the season's work.

Skeena River Hatchery.

This hatchery has been in operation since 1894 and has been most successful. Last season nearly four million young salmon were distributed. This establishment is difficult of access and is in a very isolated part of the province.

Granite Creek Hatchery.

This hatchery can always be relied upon for a big output of fry in the years of a big run of salmon. The operations are generally successful and last season was no exception to the rule, nearly eleven millions of young salmon being distributed.

Fraser River Hatchery.

This establishment has been in operation for nearly twenty years and during that time has been of great benefit to the salmon fisheries of British Columbia. Since the incumbency of the present officer-in-charge, Mr. J. A. Johnson, small rearing ponds have been provided and other improvements carried out. Last season a quantity of the surplus eggs from the Pemberton and Granite Creek hatcheries were transferred to this establishment, and over nine millions of fry were distributed from this hatchery during the season just closed.

Nimkish Hatchery.

A report on the operations at this establishment which is owned and operated by the Alert Bay Canning Co. B. C. Packer's Association, will be found with the annual reports from the officers-in-charge of the Dominion Government fish hatcheries which follow this report. Nearly five millions of fry were successfully distributed last season.

GENERAL REMARKS.

The growth of the fish-breeding service throughout the Dominion during the past few years has been large. Since 1903, thirteen new hatcheries have been put in operation, making a total of thirty-two institutions used for this purpose at the various points. The superintendence of this service involves an immense amount of clerical and inspection work, especially at new hatcheries where the officer-in-charge is inexperienced and has to be instructed in every detail. The conditions existing at the various points where these establishments are located vary so much, that instructions suited to each place must be prepared. Many and varied details and contingencies must be provided for and a wrong move at any time places the whole season's operations in jeopardy. To meet this large increase in the work, Mr. Alex. Finlayson, an officer of long and varied experience, both in Scotland and in the fish-breeding service of this country, was chosen and appointed to the position of Dominion Inspector of fish hatcheries. The duties of his office are to inspect the various establishments, instruct new appointees and report on the management of each establishment generally. All the officers connected with this service have taken great interest in their work and can be given a large share of credit for the success attending the past season's operations.

I am, sir, your obedient servant,

F. H. CUNNINGHAM,
Dominion Superintendent of Fish Culture.

ANNEX B.

REPORTS OF ALL THE HATCHERY OFFICERS.

1. BON ACCORD HATCHERY.

NEW WESTMINSTER, B. C., October 2, 1906.

Professor E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—The past year at the Bon Accord hatchery has been very satisfactory and the hatchery had a very successful year.

In July, 1905, fences were put on the streams at the head of Pitt lake, but the freshets were too much for these strongly-built structures and washed the entire capturing plant out. Before the freshets abated sufficiently to allow the rebuilding of the fences, the fish had passed and reached the higher reaches of the rivers. One hundred thousand sockeye eggs were taken in Upper Pitt.

This necessitated looking to other grounds for the supply of spawn, and Granite Creek hatchery was drawn on for 3,000,000 eggs and Pemberton Meadows hatchery for 4,500,000 eggs. The Bon Accord hatchery staff secured 2,000,000 cohoes in the Nicomekl and Serpentine waters, 100,000 in the Hatchery creek, 1,500 trout in the Hatchery creek, and 5,000 steelheads in Stave river; the last mentioned are still in the hatchery but are now hatched out.

The loss was very small, the majority of the fish being particularly healthy.

On January 31, the first distribution of the fish commenced when 3,560,000 fry were placed in the Upper Pitt river, and other shipments followed closely, Lillooet river, 1,500,000; Silver creek, sockeyes, 1,000,000, cohoes, 500,000; Coquitlam river, sockeyes, 750,000, cohoes, 1,250,000; Cowichan lake, 80,000; Sauch-en-auch creek, 60,000; Serpentine creek, sockeyes, 60,000, cohoes, 60,000; Squamish, 60,000.

An experiment was made in the planting of salmon fry on the west coast of Vancouver island, and the fish were taken from Bon Accord hatchery to make the experiment. Two hundred and fifty thousand small fish were distributed among Anderson, Sprott and Kennedy lakes on the west coast of Vancouver island, and twelve hundred trout were placed in Price lake near Victoria.

The planting of the sockeye fry on the west coast of Vancouver island, although a new feature in fish culture here was a very successful experiment, as all the fish although subjected to the roughest weather, were in a most healthy condition when liberated.

The prospects for the coming year are very bright and there is little doubt that the hatchery will have its capacity of eggs.

I am, sir,

Your obedient servant,

J. A. JOHNSON,

Officer-in-Charge, Bon Accord Fish Hatchery.

SESSIONAL PAPER No. 22

2. HARRISON LAKE HATCHERY.

HARRISON HOT SPRINGS, B.C., August 24, 1906.

E. E. PRINCE, Esq.,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit my report from this hatchery, for the present year. My last report, dated November 16, 1905, showed a total collection at that date of 31,160,000 salmon ova. We afterwards secured additional eggs, making the total 31,274,000, consisting of :

28,204,000	Sockeye salmon
2,510,000	Cohoe “
560,000	Spring “

31,274,000

of these 2,501,000, or nearly 8 per cent were picked out as unfertile or dead. The eggs and young fry did remarkably well, and the following distribution was made during March and April without loss, the fish going out in splendid condition

To Morris creek	16,000,000
“ Silver “	2,500,000
“ Trout “ and bay	10,272,000

Total distribution

28,773,000

Three ponds were made during the winter, to accommodate some of the fry, and have proved a great help. They cover an area of about 50 by 350 ft. and are supplied with water from the hatchery waste flume. All the fry that were put out at the hatchery, were allowed to work their way through these three ponds becoming thus, in a measure accustomed to outside conditions, while still protected from their enemies. For the collection of ova for the present season, in addition to the camps operated last year, it is proposed to put in fences and pens at Twenty Mile creek, where some sockeye salmon are known to run. The fences and pens at Silver creek and at Douglas creek are already in position and a few fish are in the pens at the former station.

The fences, &c., at Morris creek and at other points will be in place early in September and every effort will be made to secure as many eggs as possible, for this being an ‘off’ year hatchery work is all the more necessary and should be pushed to the utmost.

Since the distribution of the fry the interior of the hatchery has been given a coat of paint and this has greatly improved its appearance.

The public interest manifested in the hatchery and its operation is quite remarkable. Being located so close to a popular health and pleasure resort, accounts in a great measure for the streams of visitors. This past year we have had between three and four thousand visitors and our register shows names of persons from all over the world. In fact the premises are hardly ever clear of visitors and they call for an increasing amount of attention and it necessitates the building plant and surroundings being kept in a creditable state, and as far as the number of staff and means would permit, I have tried to keep the place at least presentable.

We have been somewhat handicapped in the work here, by the transfer of the more experienced men to the newer hatcheries and having to train new men to the work. This difficulty is increased by the number of collecting stations working at the same time and these points being so widely scattered. However, I am pleased to report that I have been well supported by the staff on the whole, and that some of them have taken a most exceptional interest in the work and have done everything possible to ensure success.

I am sir, yours obediently,

THOS. ROBINSON.

Officer-in-Charge.

6-7 EDWARD VII., A. 1907

3. PEMBERTON HATCHERY.

LILLOOET, B.C., May 8, 1906.

Professor PRINCE,
Commissioner of Fisheries,
Department of Marine and Fisheries,
Ottawa.

SIR,—I herewith have the honour to submit my first annual report on Pemberton hatchery to your department. A report on this hatchery would not be complete without an account of its situation and the different ways of conveyance required to reach it.

Pemberton hatchery is situated four miles to the east of the lower extremities of Pemberton meadows, at the junction of Owl creek and the Birkenhead river, four miles above its confluence with the eastern branch of the Lillooet river, which in turn discharges into Lillooet lake. The hatchery lies as near as can be judged one hundred and seventy-five miles in a north-easterly direction from New Westminster, which is the home of the fishing industry in British Columbia. The route, however, one has to travel from there to Pemberton is very circuitous, starting with a railway journey to Agassiz, a stage drive of five miles brings you to Harrison Hot Springs, where the splendid Harrison hatchery, built last year by the Dominion government can be seen four miles up the lake. The next stage of the journey is one of forty-five miles by the Harrison lake to Port Douglas, which is now but a relic of its former days, when this was the route to the Cariboo diggings.

The traveller now has to resort to a more primitive mode of travelling, and by the time he reaches Tenas lake, thirty-five miles from Douglas, he will be heartily glad to exchange his Indian cayuse for a seat in the canoe, if he has not been accustomed to riding. Tenas lake is six miles long and very narrow, being rather a widened part of the Lillooet river than a lake. At its head it narrows down to a swift river again, a mile of which brings one into Lillooet lake, sixteen miles in length. When half the lake has been traversed in a northerly direction it takes an abrupt turn to the west and from here the first view of Pemberton meadows can be had. When the river is high the canoe can be taken six miles up the river to the rancherie, but usually one has to land at the head of the lake and ride the remainder of the way, ten miles, to the hatchery.

The Birkenhead river, on which the hatchery is situated, is considered by competent authorities, to be the best sockeye spawning stream in British Columbia, and is unlike other spawning grounds in the respect that there is said to be a good run even in off years.

After the site and construction of the hatchery had been decided on, the contract for the lumber was let to Duguid & Hurlay, of Lillooet, who deserve credit for the manner in which they surmounted the difficulties incidental to bringing a 23,000 lb. saw-mill outfit, the 36 miles by raft on Seton and Anderson's lakes, and 24 miles of mountain road to Owl creek. They were three weeks on the road coming in and the same going out; the boiler alone weighed 6,000 lb., and they were engaged four months in sawing the 170,000 feet and planing 130,000 feet of lumber of which the buildings were constructed. Mr. Forrester, the building superintendent, started actual construction in May, though previous to that he had a gang of Indians employed clearing the site, making roads and hewing the sills. One could hardly imagine a rougher spot than that on which the hatchery now stands: in addition to the large trees which were sawn for lumber and their stumps blown out, the ground was covered with large boulders brought down by Owl creek in ages past.

The hatchery is a one-story building 40 feet by 150 feet long with 12-foot walls; it has 12-inch cedar foundations, 2-inch by 8-inch joists, 2-inch flooring and 2-inch by 6-inch studding, the roof is built on the truss system, which obviates the need of posts in the centre and consequently gives a clear floor space from wall to wall; the

SESSIONAL PAPER No. 22

building is sheathed with shi lap and rustic on the outside and lined with 6-inch V-joint inside; it is lighted by 27 large windows and 12 3-ft. by 8-ft. skylights, and is roofed with Elalerite fireproof roofing. The exterior is painted cream with white trimmings, and the interior white.

The hatching apparatus is thoroughly up to date in every particular. A head tank, 18 inches by 18 inches runs the entire length of the building, and the hatching troughs, 112 in number, 16 feet long, 16 inches wide and 6 inches deep, built of 2-inch plank are arranged in groups of four, with a fall of 6 inches between the upper and lower pair. Water is supplied to the troughs from the head tank through $1\frac{1}{2}$ plugs. The waste connections are 2-inch diameter and the waste ditches are 6 inches by 6 inches and 6 inches by 16 inches. The troughs, which are painted white outside and lacquered inside, hold six 16-inch by 24-inch baskets each and riffles are provided between each basket.

A floating gauge in the head tank connected to an electric circuit communicating with the boarding house rings an alarm there when the water either rises or falls an inch. This is the first electric tank alarm installed in a British Columbia hatchery. The boarding house, which is painted the same as the hatchery, is a two-story frame building, 16 feet by 24, with an addition containing kitchen, pantry and bath-room. The main building contains dining room, 12 by 16, office 10 by 12 and hall; upstairs there are four bedrooms. The interior is varnished, and hot and cold water is supplied to a sink and bathroom. A pipe line of 600 feet supplies the water.

There are also a workshop and wood-shed, 14 feet by 20 feet and 12 by 20 feet respectively, sheathed with rustic and painted uniform with the main buildings. The flume for the supply of water to the hatchery leads from a dam situated 400 feet up Owl creek; it is built of 2-inch by 16-inch, 2-inch by 14-inch and 2-inch by 12-inch 2-inch plank. It is the largest at the intake and is tarred outside and in, half way down it is broken by a 10-inch cedar log settling tank, 10 feet by 30 feet by 5 feet deep. It is at present being roofed over. There is also an emergency flume extending 150 feet further up Owl creek to a dam there in case of accident to the main one.

The work done by Mr. Forrester is creditable both to the department and himself, and his efforts to have the hatchery finished by August 1 were rewarded by the water being turned on for the first time on that date in spite of unforeseen circumstances and difficulties. In the meantime the building of the traps for the taking of the parent fish had been under way for some time. They were located 200 yards above the hatchery on the Birkenhead, at a point where there was a large rock on both sides to protect the banks. The main fence was built on the tripod system. Ten tripods made of 7-inch fir poles were placed at regular intervals across the stream and filled with rock. The height of water—four feet—made the job an arduous one. The large boulders in the bed of the stream which could not be seen, though their effect on the water was plainly visible, contributed to the difficulty. After two weeks' exertion, during which time dry clothes were almost an unknown quality, the tripods were placed in position and the stringers fastened down. The fencing proper consisted of sections 6 feet by 12 feet, made of 1-inch by 4-inch on edge, and bolted together, and had been under construction while the tripods were being placed. They were laid on the stringers with a 2 to 1 slant lying down stream, and had a yard of heavy duck-canvas nailed along the heel of them to prevent the salmon burrowing; rock was then placed in front, the pens anchored and leads built from the fence to them. There were fifteen pens in use altogether of different sizes, 12 feet by 12 feet, 10 feet by 12, and 6 feet by 12. Two more fences were built after this before the run came, one 100 yards below the first one to keep the salmon from drifting down. When the run was at its height a section of this fence had to be taken out to prevent the fish crowding too much though the space between the fences was 100 ft. by 200 feet with about three feet of water. Another fence was constructed, one and a half miles above the hatchery, as a safeguard against mishap to the lower ones.

The first sockeye arrived on August 15, but not until the 27th did the run fairly get here; on the morning of that date the pens hardly had 100 fish, but by night it was found necessary to close the leads to the pens to prevent overcrowding. From the 27th

till September 8, the leads were hardly opened, as it was found that the salmon would not stand penning. The first spawning of 100,000 ova was made on September 4, but all the fish were not in a ripe condition; on the 8th 1,000,000 were taken.

Spawning started in earnest on Monday, the 11th, and by the end of the week 8,500,000 were secured. Mr. Cunningham, superintendent of fish culture, arrived on the 15th and left on the 17th, and inspected the spawning operations and hatchery; he was accompanied by Messrs. Forrester and Finlayson. By the end of the week ending September 23, the total in the hatchery was 21,350,000, 2,500,000 being spawned by four spawners in one day.

At this time twenty men were employed. A freshet on the 21st washed a number of salmon over the lower fence and down the river, where they spawned naturally. Altogether 28 millions of sockeye ova were taken, one and a half millions of them at the mouth of the river by means of a seine. The coho run did not come up to expectations, only 600,000 ova being spawned and practically all the fish were taken in traps.

During the run of sockeye the males outnumbered the female fish five to one; they were only blocking up the pens, so I gave the Indians liberty to take all they wanted. They took over 4,000 from first to last. The Indians, I may say here, have given no cause for complaint so far. The only thing I can say against them is that their charges are extortionate.

As you are aware, Mr. Johnson, officer in charge of the Fraser River hatchery, received two shipments from here; the first lot of two and a half millions he took out himself; Messrs. Davis and Martin took down the remainder. A shipment of 4,330,000 also went to the H. L. hatchery in charge of Thos. Graham, of the staff of that hatchery. In consequence of these shipments leaving, there were several empty troughs in the hatchery. To relieve the congestion in some of the baskets which contained 50,000 ova, I am redistributing the remaining eggs over the whole hatchery at the rate of 30,000 to the basket. The main fence is still in the river; there are a few coho lying below waiting for a rise in the river; they only travel during a freshet.

Since October 1, an average of four men a day have been picking the 20,000,000 which the hatchery now contains. We are engaged at present building troughs to hold the surplus fry. I intended building outside ponds, but came to the conclusion that to do so without building a roof over them, for which we had no time, would only be courting disaster considering the snowfall of 3 to 4 feet. The troughs we are building are 12 feet long and 2 feet wide, with a partition down the centre which makes two troughs of it. They are placed beneath the hatching troughs on the floor, the waste from which passes along one side through an overflow and back the other side, making a return to the same end that it enters from, but with the partition between. There will be twenty-seven of them built this winter, and if they work well, and I believe they will, twenty-seven more could be placed beneath the upper run and fed from the head tank. They will have one advantage over outside ponds in that they will be easier kept clear of ice and snow, as the hatchery has two heaters in it now.

The experience gained this year will be of great use another season. Though the practice of holding fish in pens works well on the lower spawning grounds, I find that it fails here. Several fences are wanted in the river at the hatchery forming pools where the fish can be held. The upper fence should be high and strong and with pens in connection to spawn out of. About 200 yards down another fence should be thrown across and the first run of salmon allowed to enter and then closed up; 200 yards farther down the process could be repeated and even a fourth fence put in, if necessary; by this means the fish would mature even more than was the case this fall, when the fresh run and mature salmon were mixed up between the fences. I also found that large numbers of sockeyes spawn between the hatchery and the mouth of the Birkenhead. The early run of sockeye pushes on to the head waters of the streams they frequent; the subsequent schools run till they come up with the preceding one, and so on, and the late ones content themselves by spawning on the first bar they encounter. A fence put in during the latter part of the season at the mouth of the river would take a large number of fish that would otherwise never ascend to the upper fences, and the ova taken there could be sent direct to the lower hatcheries.

SESSIONAL PAPER No. 22

The first season at a new hatchery is always the worst, as the spawning conditions vary in streams a few miles apart, and a system which works well in one may prove a failure in another. But I would like to say that the staff of seven have done their best to make it a success, and so also has the local help employed.

The result of the season's work at this establishment consisted of a total distribution 17,450,000 of healthy fry.

I have the honour to be, sir,
Your obedient servant.

ALEXANDER ROBERTSON,
Officer in Charge.

4. GRANITE CREEK HATCHERY.

KNALT, B.C., August 22, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit the following report on the operations at this hatchery during the past season. The eggs were collected between August and December and were disposed of as follows:—

Sockeyes from Scotch creek	12,920,000
“ Adams river	3,448,000
“ Granite creek	1,610,000
	<hr/>
	17,978,000
Cohoos from Granite creek	240,000
	<hr/>
Total salmon ova	18,218,000
Of those	3,625,000 eyed.
And	875,000 uneyed eggs, were sent away.
	<hr/>
	4,500,000
1st shipment to Fraser river hatchery—	
Uneyed sockeye	875,000
Eyed “	125,000
	<hr/>
	1,000,000
2nd shipment to Fraser river hatchery—	
Eyed sockeye	2,000,000
Shipment of eyed sockeye to Harrison hatchery	1,500,000
	<hr/>
Total ova shipped	4,500,000
Dead eggs picked out—	
Sockeye	2,804,000
Cohoos	26,000
	<hr/>
	2,830,000
Fry liberated	10,888,000
	<hr/>
Sockeye	10,674,000
Cohoos	214,000

These fry were released at the hatchery.

6-7 EDWARD VII., A. 1907

The nearest good place, being at the head of the Anesty, or north-east arm of the Great Shuswap lake, a distance of thirty-seven miles from the hatchery.

The upper seven-miles of this arm is ice bound until the end of March, and the spring storms on the lake make the distant distribution of the fry impracticable.

If the fry from Scotch creek ova would return to the Hatchery creek, and make another Morris creek of it, it would be a great advantage; Scotch creek being sixty-five miles distant, and on an Indian reserve, where difficulties with the Indians have to be obviated.

The first sockeye arrived at Scotch creek on August 12.

On the 15th six others put in an appearance.

The first shipment of ova was sent to the hatchery on August 24, and began to hatch on October 25.

On December 10, sockeye were still spawning in the Little river, between the Great and Little Shuswap lakes. Traps were first put in on Granite creek, Scotch creek, and the Anesty river: but the run of fish was so heavy, that at Scotch creek, all available trays were required, and the Anesty fish had to be admitted to the river.

There were two distinct runs, the last was of smaller fish, with pale flesh.

They were very soft, and possibly the paleness of their flesh was due to their ripeness.

Many of this last run reached the Hatchery creek at the extreme end of the Shuswap lake.

Many humpbacks came with the sockeye to Granite creek where they had never been seen before.

This second run made a great rush for Adams river, it being the first stream they encountered on reaching the lake, and a trap was put in the smaller channel; the main channel of Adams river, being a large swift stream, could not be used without great expense.

Great numbers of these fish spawned in Little river, below the Great Shuswap lake, and for miles along the lake shore, at its lower end.

This fall there will be a small late run at Adams river.

The mud in Granite creek is a great annoyance, and last season two men were steadily employed for two months keeping the mud washed out of the troughs.

This deposit of mud was so heavy that in fourteen hours, the ova in the baskets was not visible.

The creek flows between steep banks of clay and fine micaceous silt, and is blocked to its source with limbs and brush, which catch and hold the dead leaves falling into it during the autumn.

This accumulation of dead leaves catches the clay, which heaved by the frost, washes from the banks in the spring.

As these leaves decay and disintegrate, they keep ever coming down, releasing the successive layers of mud.

TROUT.

During May, 1906, 75,000 eggs of the *Salmo Kamloops* were taken at Skimekin creek.

This creek flows into Skimekin lake, which was stocked with trout fry from ova taken at Canoe and Granite creeks.

The fry this season were liberated in Granite creek; it having become exhausted as a spawning ground of the *Salmo Kamloops*.

Parties of anglers who visited Skimekin Lake this season secured good catches, many of the fish weighing $3\frac{1}{2}$ to 7 lb.

Your obedient servant,

D. S. MITCHELL.

5. SKEENA RIVER HATCHERY.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit herewith my fourth annual report of work done at the Skeena river hatchery for the season 1905 and 1906.

On July 17, I arrived at the hatchery accompanied by Messrs. A. W. Pretty, J. B. Johnstone and S. Whitwell after ten hours hard poling up the Lakelse river.

On the 22nd, I paid a visit to the spawning grounds at the head of Lakelse lake, which is about eight miles from the hatchery, and found a few sockeyes up there. I then returned to the hatchery and began preparations for getting everything ready to move up to Sockeye river.

On August 1, we left the hatchery for the spawning grounds with some supplies and material for our traps, fences, &c., and by the 9th we had placed in position about 280 feet of fencing, also our traps.

I then returned to the hatchery leaving Messrs. Pretty, Johnstone and S. Whitwell up at the spawning grounds, to get additional stakes, rock, &c., to make the fences secure.

On the 11th, I noticed several spring salmon spawning in Lakelse river and Coldwater creek.

On the 14th, by permission of the department, I engaged Messrs. E. and F. Michaud to do some necessary work at the dam.

On the 19th, Messrs. Pretty and Johnstone came down from the spawning grounds and reported part of our fences washed out, I immediately returned with them taking Messrs. E. and F. Michaud and two Indians with us, and we got them placed in position again and on the same night we trapped several hundred sockeyes; next day we started spawning and got 176,000 eggs, which I took back to the hatchery.

Messrs. Pretty and Johnstone arrived on the 30th with another shipment of 48,000.

I then returned to the spawning grounds and, on September 3, we got 520,000; September 8, 592,000; September 14, 776,000; September 16, 1,016,000, and on September 21, 800,000. Altogether 3,928,000, filling every basket that the hatchery can accommodate. On the latter date we were very fortunate in getting the hatchery full of ova; as it rained very hard for several days causing a big flood which brought large cottonwood and spruce trees down the river, smashing our fences and carrying one pen of fish away entirely, containing several hundreds of ripe sockeyes.

On September 22, we caught two cohoes and noticed a good many in the river.

On October 1, we had another flood; in fact, nothing but floods and freshets since the 5th of August, which hindered us considerably in getting our fences and pens out of the river before the 4th of October, at which date all work at the spawning grounds was finished.

From that date we had heavy rains, and on November 13 we had the worst flood of the season; the water in the Lakelse river and Coldwater creek overflowed the banks and we had two inches of water on the hatchery floor. At one time it began to look serious, so much so that we had the canoe and skiff tied up to the hatchery in case anything should occur.

On November 16, the first fish hatched 88 days after spawning.

On December 1, nine inches of snow fell, only to be followed by heavy rains which lasted until January 9, and on the 21st we had a cold snap the thermometer going down to 12 below zero, from that time fine frosty weather with snow, and on January 24, 47 inches of snow on the level, but from that date until the first week in April we had fine frosty weather with occasional snow falls.

6-7 EDWARD VII., A. 1907

From the middle of January until the young fry were liberated the supply water for the hatchery kept in splendid condition but very cold, for several weeks the water in the tanks registered 32°.

I am very glad to say that the past season has been the most successful season that we have had, notwithstanding all the floods and disadvantages we had to contend with.

I adopted a new plan of picking the eggs all through the hatchery twice a week and turning all of them every day, which I found a great success, doing away with all signs of fungus, so much so that the percentage of bad eggs picked out has been less than 4 per cent.

On April 4, we planted 500,000 young fry in Coldwater creek.

April 17, 1,000,000 on the parent spawning ground at Sockeye river.

April 18, 500,000 in Sockeye river.

April 18, 1,784,450 in Lakelse river and Coldwater creek, making all together 3,784,450 young fry liberated.

April 4, Coldwater creek.....	500,000
“ 17, Sockeye river.....	1,000,000
“ 18 “ “.....	500,000
“ 18, Lakelse river and Coldwater creek.....	1,784,450
Bad eggs picked out.....	143,550
Number of eggs put in hatchery	3,928,000

On April 19, I left Mr. J. B. Johnstone to take charge of the hatchery and Messrs. Pretty, J. Williams, S. Whitwell and self left in a canoe with Indians for Port Essington, a distance of 75 miles, which we accomplished in 12 hours. We then had to wait three days for a steamer, whence we proceeded to Vancouver and Victoria, where we arrived on the 25th.

In conclusion, I may state that there will have to be another small expenditure at the dam this coming season; in fact, it appears to me that there will have to be a small outlay expended every year after the floods, on account of the low banks and the surrounding country being overflowed.

I remain

Your obedient servant,

THOS. WHITWELL,

Officer in Charge.

6. RIVERS INLET HATCHERY.

RIVERS INLET, September 5, 1906.

Professor E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I beg to lay before you a report on the hatchery built on O-wa-Keeno lake (Rivers Inlet) in 1905. We commenced work on a trail from the head of Rivers Inlet of the Wannuck river, to the head of the rapids on said river a distance of about 3 miles, we then proceeded to the site selected for the hatchery which was so rough with large stumps, rocks and fallen trees it would have taken all summer to clear it; and with so many men on the ground, and carpenters unable to go to work at once, I decid-

SESSIONAL PAPER No. 22

ed to go a little closer to the lake shore. I was able to get a contract made with the Indians to carry our lumber from the mill to the hatchery, but we had much difficulty to get them to fulfil the agreement as it is a very rapid running river. We had very favourable weather while the building was in course of construction, but when nearly finished the rain came on, and the water came under and around the building rising nearly to the floor mixing lumber, logs, and roots in dire confusion; luckily the lake did not keep high for any great length of time and we got things in fairly good shape again. The building itself did not suffer badly from the fire which I reported and without any out side help we got it restored and repainted, and the traces of the fire are now scarcely visible.

After the high water of 1905, I set about building a crib around the hatchery which is now well advanced. This was no easy matter as the rock is of such an immense size in the neighbourhood of the hatchery that we had either to blast or bring it a great distance. The creek, which supplies the hatchery is, when high, a perfect torrent and as rocks and huge boulders have been accumulating in its present bed, causing it to overflow and threaten the building (when high) is still dangerous, but we have blasted out and levelled some of the worst places, though much work remains to be done.

It may look as if a blind selection of a site had been made but the sites in the first 20 miles of the lake are all subject to overflow and pretty much alike, and I see no other that excels or equals it in that distance. The lake is never at rest, either rising or falling; if you leave a boat on the beach she is either high and dry or pounding herself to pieces on the shore, and the mountains are so steep that when it rains, (*and it can rain here*) it pours down their sides into the ravines at their base and then up comes lake and river.

We commenced operations for collecting ova on August 20, 1905, putting fences in two creeks which I thought would give us a supply and could fence securely enough to withstand the freshets. By September 20, we had 3,000,000 eggs in the house. It then commenced to rain and washed our fences out. Our fences were very substantially built, and braced every way, and I believe could have withstood the pressure of the water, but when a tree or drift log came down, everything went before it and you have to recommence with most of your picket washed away and unable to be nearer than the mill. We did recommence and on October 20, had our complement of eggs in the house—10,000,000. We did not succeed quite so well as I had wished in rearing the ova. Our feed pipe for water lay on the bed of the creek with sand, small rock and even adult salmon at liberty to enter and choke it up, causing many interruptions and irregularity of the flow of water over the eggs in the house and when frost came the stopping of it altogether. However, we managed to avoid this and came out with an output of 8,000,000. The young fish were distributed on the lake shore in a radius of 2 miles of the hatchery, and amongst great quantities of the naturally raised fry which are there in great numbers in the spring of the year. The Owakeeno lake has a length of 47½ miles, the mountains coming abruptly into the lake with little or no shore for the first 20 miles. Out of every valley comes a creek or river of more or less volume, and the salmon divide and go up all of them, giving no great quantity of fish to any one stream, unless it be the very large ones. Some of these streams are so large we could not begin to fence them with our present methods, and they are so foul with driftwood and obstructions that you cannot use a net. A notable exception to this is the Nimpkish lake 15 miles long. In it there are no salmon streams till you get to the head where three rivers come in, and you have all the salmon in the lake close to your hatchery.

In conclusion I would state that we have to get some of our eggs 24 miles from the hatchery? If it comes a head wind it may be two days before they reach it, and in a crowded row or sail boat you cannot tell what treatment they receive, as the lake is subject to heavy and sudden squalls, and a heavy sea gets up. It would be to the interest of the industry that the department supply a small steamer to carry eggs and perform other useful work, and in these days of steam, electricity, gasoline, &c., I think one could be obtained at a moderate cost.

I have the honour to be, sir,

Your obedient servant,

WM. ROXBURGH,

Officer in Charge R. I. Hatchery.

7. NIMPKISH HATCHERY.

(Owned and operated by the Alert Bay Canning Co. B. C., Packers' Association.)

VANCOUVER, B.C., April 23, 1906.

Professor E. E. PRINCE,
 Dominion Commissioner of Fisheries,
 Ottawa.

SIR,—As per agreement with the Dominion government, we submit the report of operations of our Nimpkish hatchery for season 1905-6.

We stripped our first fish on the 30th day of September, taking 92,000 eggs, and continued taking eggs until the 11th day of October, all baskets then being full. We again started taking spawn on the 18th of October, more baskets having been received; and filled all of them by the 21st October.

We are pleased to state that we took in all 5,037,000 eggs and that we turned out 4,873,400 healthy sockeye fry, showing a loss of a little over 3%, which we consider an excellent showing. Most of the young sockeyes were put into the Nimpkish lake. The supply of parent fish was ample—we having used only a small part of the supply. Our superintendent reports sockeyes spawning in the creek adjacent to the lake late in December.

The last of the young sockeye were put out on the 18th April.

Eggs received in hatchery.	5,037,000
Total loss of eggs picked out	162,000
“ “ dead fry	1,600
	163,600
Sockeye fry planted in lake.	4,873,400
	5,037,000

Respectfully submitted,

B. C. Packers' Association.

WM. H. BARKER,
General Manager.

SESSIONAL PAPER No. 22

8. SANDWICH HATCHERY.

SANDWICH ONT., August 22, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit to you my annual report of the operations conducted at the Sandwich hatchery during the past season.

Out of 75,000,000 whitefish eggs which were placed in the hatchery last fall, 63,000,000 young fry were hatched and distributed in the waters named below in a healthy and thriving condition.

Point Edward, Lake Huron.....	4,000,000
Peach island, Detroit river.....	2,000,000
Fighting island ".....	3,000,000
In bay below Fighting island.....	3,000,000
Stony island, Detroit river.....	4,000,000
Bois Blanc island ".....	7,000,000
In lake below Bois Blanc island.....	5,000,000
Pigeon bay, Lake Erie.....	4,000,000
Bar Point ".....	2,000,000
Colchester ".....	1,000,000
Leamington ".....	1,000,000
Rondeau ".....	1,000,000
Port Stanley ".....	1,000,000
Hamilton, Lake Ontario.....	1,000,000
Niagara ".....	1,000,000
Toronto ".....	1,000,000
Belleville, Bay of Quinte.....	1,000,000
In river at hatchery.....	21,000,000
Total.....	63,000,000

COLLECTING PICKEREL EGGS.

After the distribution of whitefish was completed we again filled up the jars with pickerel (doré) eggs which were collected from the pound-nets in Lake Huron. The number of eggs obtained was 50,000,000 from which were hatched 25,000,000 young fry and disposed of as follows :

Lake Huron.....	4,000,000
Round lake, Havelock, Ont.....	500,000
Belmont lake ".....	500,000
Trent river ".....	500,000
Burlington bay, Hamilton, Ont.....	500,000
Thames river, Bothwell, Ont.....	300,000
Sydenham river, Dawn Mills, Ont.....	300,000
Detroit river.....	18,400,000
Total.....	25,000,000

The above fry were placed in the waters in a first-class condition.

I have the honour to be, sir,
Your obedient servant,

WM. PARKER,
Officer in Charge.

9. NEWCASTLE HATCHERY.

NEWCASTLE, August 21, 1906.

Professor PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit herewith my report on the operation of this hatchery during the past year.

According to instructions I proceeded to Wiarton on the second day of October last, with the usual assistance, to procure the necessary supply of salmon trout ova for this and other hatcheries.

We succeeded in placing our nets for fishing on the 21st of October. We did not succeed in securing any great quantity of eggs until about the 7th of November ; it almost seemed at one time that a partial failure was in store for us, but I am happy to state the fish came on later than usual and by the time the season wound up, we had a full supply of ova for this and the other hatcheries.

I handed over to Mr. Walker 1,000,000 for the Ottawa hatchery, also 800,000 for Mount Tremblant on the 15th of November, also 300,000 to Magog hatchery, which left us with about 2,000,000 for the Newcastle hatchery which have done well and which appear in my report as to distribution.

Our hatchery is in fine condition and in good repair, I am now raising a number of yearling salmon trout and am placing two extra tanks at the spring to give them extra room to develop, and will, I consider, be a great advantage to the raising of young salmon trout.

We also have a goodly quantity of young black bass which will number about 2,000, and they, by all appearance, seem to be doing well and ready for distribution this fall.

Our plant at Wiarton is in good condition. Our spile driver will need fresh caulking and the nets overhauled ; outside of that, the expense will be nominal.

The following schedule will show the points of distribution, also the number of fry placed in each locality last spring.

Lake Ontario, Consecon	250,000
“ Picton Sandbanks	300,000
“ Newcastle.....	200,000
Lake Simcoe, Barrie.....	200,000
Lake Huron, Southampton.....	200,000
Georgian bay, Wiarton.....	200,000
Charleston lake, Athens.....	150,000
Rideau lakes, Portland.....	25,000
“ Westport.....	25,000
Total.....	1,550,000
Two year old Salmon trout.	
Charleston lake.....	300
Bay Quinte, Belleville.....	200
Total.....	500

I beg to inform you the fry were all deposited in the different waters in the very best condition.

I have the honour to be, sir,
Your obedient servant,
WM. ARMSTRONG.

SESSIONAL PAPER No. 22

10. OTTAWA HATCHERY.

OTTAWA, August 18, 1906.

Profesor E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I beg to submit my annual report of the season's operations carried on at the Ottawa hatchery.

On November 10 last I received from St. John, N.B., through Inspector Finlayson about 125,000 Atlantic salmon eggs.

On November 15 I received from Mr. Wm. Armstrong about 1,000,000 salmon trout eggs.

On March 18 I received from the Magog hatchery about 75,000 gray trout eggs.

On the same date I received from the Bark River hatchery about 50,000 brook trout eggs.

On May 24 I received from the Magog hatchery about 100,000 speckled trout six weeks old.

All the above eggs were received and laid down in the incubating troughs in first-class condition, hatching out strong and healthy in the latter part of May and the first week in June.

The work of distributing the fry was very successfully done by Messrs. A. Halkett, J. B. Rochon, U. Grignon and S. J. Walker.

The young fry were all deposited in the undermentioned waters.

Distribution of Salmon Trout.

Lady lake.....	21,000
Lake Gregoire	35,000
Grenville lake.....	21,000
Fairy and Mary lakes.....	21,000
St. Bernard and Stony lake.....	28,000
White Stone lake.....	28,000
Clear lake.....	28,000
Moscou lake.....	28,000
Villa Mon Repos.....	28,000
Mulgrave and Perch lakes.....	35,000
St. Sixte lake.....	42,000
Larocque lake.....	28,000
Miqué lake.....	28,000
Wilson lake.....	35,000
Grass lake.....	35,000
Chelsea lake.....	14,000
Moose lake.....	28,000
Maskesty lake.....	35,000
Beauport lake.....	28,000
Maheux lake.....	28,000
Bleu Lea lake.....	42,000
Pemichongan lake.....	42,000
Gormon lake.....	42,000
Sharbot lake.....	42,000
Ramsay lake.....	28,000
Meache's lake.....	42,000

812,000

6-7 EDWARD VII., A. 1907

In addition to this, on March 21, we shipped 50,000 salmon trout eyed eggs to Alex. Mowat, of the Restigouche hatchery, N.B.

On the same date we also shipped to Alf. Ogden, of the Bedford hatchery, N.S., 50,000 salmon trout eyed eggs, making the total distribution of salmon trout 912,000.

DISTRIBUTION OF GRAY TROUT.

Otty lake.....	8,000
Bass and Otter lakes.....	10,000
L'Achigan lake.....	10,000
Bissonette lake.....	8,000
St. Esprit lake.....	8,000
Christie lake.....	6,000
Lady lake.....	5,000
Findlay lake.....	10,000
Chelsea lake.....	2,000
	<hr/>
	67,000

DISTRIBUTION OF ATLANTIC SALMON.

Chelsea lake.....	10,000
Moose lake.....	20,000
Charleston lake.....	40,000
Sharbot lake.....	20,000
Salmon and Bark lakes.....	30,000
	<hr/>
	120,000

DISTRIBUTION OF BROOK OR SPECKLED TROUT.

Seventh lake.....	12,000
Ricard lake.....	12,000
Lady lake.....	8,000
Plato creek.....	8,000
Two-mile pond.....	8,000
Otonabee.....	8,000
Hudson Heights.....	8,000
Scotch river.....	8,000
Big Head river.....	8,000
Dunn's creek.....	8,000
Grenville.....	4,000
Clear lake.....	8,000
Fairy and Mary lakes.....	8,000
Ste. Bernard and Stoney lakes.....	4,000
White Stone lake.....	4,000
Green lake.....	4,000
Chelsea lake.....	4,000
	<hr/>
	124,000

RECAPITULATION.

Salmon trout.....	912,000
Gray trout.....	67,000
Atlantic salmon.....	120,000
Brook trout.....	124,000
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SESSIONAL PAPER No. 22

Total distribution of fry from the Ottawa hatchery closing the season 1905-06, was 1,223,000.

During the year about (18,000) eighteen thousand persons visited the hatchery.

The hatchery has been repainted and repaired and is now in readiness for next season's operations.

I have the honour to be, sir,

Your obedient servant,

JOHN WALKER,

In charge of Ottawa Hatchery.

11. MAGOG HATCHERY, P.Q.

MAGOG, August 31, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—In submitting my annual report on the operations at this hatchery during the season of 1905-06, I have much pleasure in stating that the several species of fish eggs handled turned out very satisfactorily and the fry were distributed as follows:—

Salmon Trout.

Lake Suivant and Dudswell.....	15,000
" Noir.....	40,000
" Stoke.....	15,000
" Adstock.....	25,000
" des Poulins.....	15,000
" Dussault.....	30,000
" Ste. Modeste.....	25,000

Speckled Trout.

Lake Weedon.....	5,000
" Long.....	10,000
" at Cookshire.....	20,000
" St. Hubert.....	10,000
" Tortue.....	10,000
Rivière du Loup and Cleveland.....	15,000

Gray Trout.

Lake Megantic.....	75,000
" Broome.....	65,000
" Massawippi.....	60,000
" Memphremagog.....	100,000
" St. Francis.....	10,000
" Dennison.....	25,000
Libbey and Key Ponds.....	35,000

Atlantic Salmon.

Lake Memphremagog.....	10,000
" Massawippi.....	10,000

In addition to the above distribution 250,000 fry were transferred to the rearing ponds at Lake Lester.

The fry were all distributed in splendid condition.

I have the honour to be, sir,

Your obt. servant,

A. L. DESEVE.

6-7 EDWARD VII., A. 1907

12. MONT TREMBLANT HATCHERY.

August 20, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I received, on the 15th November, 1905, 600,000 salmon trout eggs, and, on the 22nd February, 1906, 60,000 red trout eggs.

Of these were distributed : 500,000 salmon trout fry, and 55,000 red trout fry, in the following lakes :—

Lake Tremblant ;

- " Boisfranc, near Lake Tremblant ;
- " Pimodeau, by Nomingue ;
- " Wanish, Noir & Argente, by Montford ;
- " Superieur, Sauvage & Paquette, by St. Faustin ;
- " Charlebois and Masson, by Ste-Marguerite ;
- " Cornu, by Nantel ;
- " Labelle, Clair and Croche, by Labelle ;
- " de Sable, at Ste. Agathe ;
- " Mercier, near Mont Tremblant.

The fry were distributed in fine condition,

I have the honour to be, sir,
Your obedient servant,

ALPHONSE ROBERT,
Officer in Charge.

13. ST. ALEXIS HATCHERY.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—In accordance with your instructions, I have the honour to submit my annual report on the operations at this hatchery during the past season.

I may say that the work at this hatchery is almost exclusively devoted to the collecting and hatching of speckled trout.

The department is well aware of the difficulties to be contended with in securing large quantities of this species of fish.

However, I am glad to be able to report that (653,000) six hundred and fifty-three thousand eggs were collected and laid down in the troughs in good condition, the first fry appearing about the twentieth of April, and were distributed in the following waters :

Lac Patterson	15,000
" Winchester	50,000
" Vierge	20,000
" Caribou	30,000
" Des Six	38,000
" Corolus	60,000
" St. Jovite	20,000
" La Pêche	100,000
" Sans Bout	50,000
" Bonne Terre	20,000
" Bluets	20,000
" Boulanger	50,000
" Three Lakes	20,000
Eyed eggs shipped to other hatcheries	150,000

SESSIONAL PAPER No. 22

I may say that all the fry were planted in good condition and the loss during incubation was almost nil.

I have the honour to remain, sir,

Your obedient servant,

JOS. ELLIOTT,
Officer in Charge.

14. BALDWIN'S MILLS REARING PONDS, QUE.

BALDWIN'S MILLS, Aug. 29, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit the following report for the past year.

This establishment has been very successful in the rearing of fish so far, viz., gray salmon and speckled trout, ouananiche and Atlantic salmon and Pacific salmon. The parent brook or speckled trout now in the retaining tanks are looking fine and healthy, and the prospects are that a very much larger percentage of ova than last year will be procured.

From the 260,000 fingerlings on hand last fall, as previously reported, I delivered to Messrs. Deseve and Merry, of the Magog hatchery, which they report as being distributed in first-class condition as follows :—

Gray Trout Fingerlings.

Fall 1905.

Lake Memphremagog.....	35,000
Lake Massawippi.....	15,000

Salmon Trout.

Lake Memphremagog.....	35,000
Lake Massawippi.....	30,000

Salmon.

Lake Memphremagog.....	10,000
Lake Massawippi.....	10,000

Ouananiche.

Lake Croche.....	9,000
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Gray Trout.

Lake Lester (distributed by self).....	6,000
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Gray Trout.

Spring, 1906.

Lake Lester, per self.....	21,000
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Salmon.

Lake Lester, per self.....	69,000
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Yearlings, Salmon Trout.

June, 1906.

Orford Lake, per Messrs. Deseve and Merry..... 4,000

August, 1906.

Lake Memphremagog, per Messrs. Deseve and Merry..... 4,000

To be distributed as per orders.

Yearlings, Salmon Trout.

Lake Massawippi..... 2,000

I am also pleased to report that I received, June, 1906, in good order from Magog hatchery—

Salmon fry..... 75,000

Gray Trout fry..... 75,000

Salmon Trout fry..... 100,000

The road recently built by the department to this establishment has proved a boon, the distributing of fish, freighting, &c., is accomplished more easily now than by boat, as formerly.

Some 48 tons of ice were put in the ice house last winter. I find a large amount is required for distributing purposes and keeping fresh liver for food.

The fish in the rearing tanks have grown well, with very little loss, though not quite as large this season as last owing to the fact that the winter was long and severe, the hatching being a month later. At present time they are from 2 to 2½ inches in length.

I might also suggest that on account of bad roads the distribution of fish should be no later than the last of September or 1st of October, they will be then 3 to 3½ inches long.

The whole respectfully submitted,

I have the honour to be yours very truly,

W. G. BELKNAP,

Officer in Charge.

15. TADOUSAC HATCHERY.

TADOUSAC, August 20th, 1906.

Professor E. E. PRINCE,

Dominion Commissioner of Fisheries,

Ottawa.

SIR,—In accordance with your instructions, I have the honour to submit my report for the operations carried out in the Tadousac hatchery for the present year. From the crop of salmon eggs of November last, 3,500,000 deposited on the trays in the Tadousac hatchery; 250,000 salmon eggs were packed in moss and sent to the Roberval hatchery to be hatched there and planted this season in the rivers of the Lake St. John. On the first of April last some 500,000 eyed salmon eggs were also packed in moss and sent to our new Ste. Marguerite river hatchery. All precautions were taken to make a success of it. The boxes of salmon eggs have been carried on a sled fitted up with springs to prevent the least knock on the road. Those 500,000 salmon eggs hatched out well in the first days of May and were planted by myself in June in the Portage river tributary of the Ste. Marguerite salmon river. The balance of the salmon eggs

SESSIONAL PAPER No. 22

2,750,000 remaining in the Tadousac hatchery hatched out in May, and the salmon fry to the number of 2,435,000 were distributed in the following rivers and lakes :—

Murray Bay river	200,000
Little Saguenay river	100,000
St. John's river	100,000
Jacques-Cartier river	125,000
Ste. Marguerite river, North east B.	200,000
Baude river	500,000
Chisholm river	500,000
Long lake	300,000
Gobeil's lake	300,000
Du Gouffre river by the proprietor, Wm. Kennedy	10,000
	<hr/>
	2,335,000
A Mars river, Ha Ha bay	100,000
	<hr/>
	2,435,000

As usual, we set our two salmon nets in May for the capture of parent salmon. The salmon came in much earlier than usual and in large number. On the 11th of July, we had secured seven hundred fine parent salmon and our salmon nets raised. Of that number 400 were females and 300 males now in the salmon pond and being much admired by a great number of visitors. Besides the 700 parent salmon in the pond waiting for the spawning time, 295 salmon of smaller size were liberated at the door of the salmon fisheries, and 41 damaged salmon were sent to the nuns of the Hospital 'Hotel-Dieu St-Valier,' Chicoutimi. In all probability, at the spawning time, I will collect at least 4,000,000 eggs. The new Ste. Marguerite river hatchery, situated on a fine stream of the purest water, will prove to be of great benefit for the river and the salmon fisheries in general.

The president of the Ste. Marguerite Salmon Club, Mr. William Mitchell, of New York, went up in July to see the hatchery and was very much pleased with it. The net salmon fishing has been very good. We have been favoured in it by the good easterly wind prevailing in all the fishing season. The fly fishing has also been splendid in all the salmon rivers tributaries of the Saguenay river. The guardians of the salmon rivers report them well stocked with parent salmon. Mr. J. N. Maher, employed by the Provincial Government as guardian of the Saguenay river, told me that he saw enormous quantities of salmon at Ha Ha bay at the entrance of the River à Mars, where some salmon fry from the Tadousac hatchery have been planted every season for the last twenty (20) years. As soon as our salmon nets were taken off, I set my men for the remainder of July to work at some temporary repairs to the dam of the salmon pond, which leaked so much that a small depth of water was remaining in the pond at low tide, and I was afraid for the safety of our parent salmon. On the 3rd of August I had the pleasure of the visit of the Hon. Minister of Marine and Fisheries. The sidewalk leading to the kiosk of the salmon pond, broken by the ice, has been replaced, to the great delight of the visitors. The Lakes Long and Gobeil, with great quantities of fresh water smelts, proves to be a good nursery for our young salmon. About ten days ago a gentleman fishing for trout in the Gobeil's lake caught three fine specimen of young salmon, weighing $2\frac{1}{4}$ and $2\frac{1}{2}$ pounds. The first planting of some salmon fry there had been done in 1902. Those young salmon go down to the St. Lawrence river by the Little Bergeronnes river.

I have the honour to be, sir,

Your obedient servant,

L. N. CATELLIER.

6-7 EDWARD VII., A. 1907

16. GASPÉ HATCHERY.

GASPÉ, September 10, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit my annual report upon the work of the Gaspé hatchery during the past year.

As stated in my last report of December 9, 1905, I laid down in the troughs on November 5, about 1,250,000 eggs, and I am pleased to be able to report that I had a very small percentage of loss.

Owing to the cold late spring, the fry were late in hatching out, and I only commenced planting them in the rivers on July 3, but having a good supply of canoes we got them out quickly and in fine condition, an officer from the hatchery supervising the planting in one of the rivers every day. They were planted as follows:

River St. John (Douglastown).....	336,000
River Dartmouth	382,000
River York	382,000
Making a total of.....	1,100,000

I am pleased to be able to report that both the salmon net and fly fishermen have had a most successful catch this last summer, and the guardians still on the river report great quantities of salmon now on the spawning beds; and amongst them large numbers of grilse and small salmon.

The hatchery is cleaned up and trays, &c., put in good shape for the work for the coming season.

I have the honour to be
Your obedient servant,

R. LINDSAY,
Officer in Charge.

17. RESTIGOUCHE HATCHERY.

FLATLANDS, near CAMPBELLTON, August 22, 1906.

Professor E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to transmit herewith my twenty-sixth annual report upon the operations of the Restigouche hatchery during the past year.

The Government net and W. G. McBeaths licensed net were operated for a short time during the season of 1905, for the capture of parent fish, some 175 very large fish were collected from both nets, and as these were two-thirds female, fully one million fine eggs were collected and deposited in the hatching troughs last autumn. These were further supplemented by a quota of 750,000 eggs from the Carleton pond, St. John, filling the hatchery almost to its usual capacity. Great success was accomplished in

SESSIONAL PAPER No. 22

the care and hatching of these eggs, not more than 10 per cent being lost during the period of incubation and after fry had hatched.

The work of distributing the fry in the various streams and rivers began June 20, and they were planted in fine condition as follows:—

Restigouche river between hatchery and mouth Kedgwick, towed by scow.....	900,000
Upsalquitch river, towed by scow.....	300,000
Matapedia lake, by train.....	100,000
Matapedia river “.....	200,000
Matamaga Salmon Club, Causapsal, held over in tanks.....	25,000
Held over in hatchery in pond and tanks.....	50,000
Total.....	1,575,000

Salmon Trout.

50,000 semi-eyed eggs received from Ottawa hatchery in
April.

Fry distributed in Lake Matapedia..... 45,000

Grand total..... 1,620,000

The departmental net and W. G. McBeath's licensed net were again set this season about the 1st of June, for the capture of stock fish, both nets were only kept fishing for three weeks, when they were taken up, having captured 340 fine large salmon, the greatest catch in the history of the government net; these fish will yield a very fair supply of eggs for the stocking of the hatchery this fall.

Upon further investigation, I find a great deal of uncertainty existing in connection with the establishment of a salt water pond.

Rather than disturb the present departmental net and pond, it would be better to lease out one or two more of the licensed nets, which are set immediately below the government net, and permit of those fish which are now going into the market being captured for the pond and stocking of the hatchery. Were such a scheme adopted, our net could be raised early in June, when a sufficient supply of fish was obtained, which was the case this season. This method would always guarantee a good supply of fish, at less cost than constructing a new pond.

Since the distribution of the fry, the hatching house has been dried and thoroughly cleansed, and all trays and troughs revarnished and made ready for the reception of the ova this autumn.

Trusting the foregoing report will meet with your approval,

I am, sir,

Your obedient servant,

ALEXANDER MOWAT,

Officer in Charge.

18. GRAND FALLS HATCHERY.

GRAND FALLS, N.B., August 27, 1906.

Prof. EDWARD E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I respectfully request herewith to transmit to you a statement of the work done at the St. John river fish hatchery under my charge, since the month of November 1905. About the 14th of that month I received my quota of salmon eggs from the Carle

6-7 EDWARD VII., A. 1907

ton pond, about one million six hundred thousands; they arrived at the hatchery in good order in charge of my assistant Frank J. McCluskey, and were placed on the trays immediately on arrival, and they did remarkably well all winter and hatched out a very good percentage of young in the spring, they were carefully handled and kept clean during the hatching season with a good supply of pure cool water all the winter.

On June 18 we commenced to distribute the young fry into the following named waters, with the approximate number in each place:

Ste. Croix river, in Charlotte county	150,000
Tobique river, in Victoria	250,000
Salmon river	245,000
St. John river	500,000
Rapide des Femmes	150,000
Skiff lake, York county	55,000
	<hr/> 1,350,000

I am very much pleased to be in a position to inform you that the distribution of the fry was well and successfully done.

All of the foregoing is respectfully submitted.

I am, sir,

Your obedient servant,

CHAS. MCCLUSKEY,

Officer in Charge.

19. MIRAMICHI HATCHERY.

SOUTH ESK, N.B., August 30, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I beg to submit the following report on the operations at this hatchery during the past year.

By reference to my last annual report, December 7, 1905, it will be seen that the total number of ova collected here last autumn amounted to 2,375,000. Of this number 650,000 were shipped to the hatchery at Windsor, N.S., leaving a balance of 1,725,000 in this hatchery. This number of ova was carried through the winter months without any loss above the usual percentage, and at hatching time yielded 1,650,000 healthy fry, which were distributed in the following waters:

Northwest Miramichi	700,000
Little Southwest Miramichi	500,000
Main	200,000
Sevogle river	175,000
Pleasant lake, King's county	50,000
Shediac river, Westmorland county	25,000
Total	<hr/> 1,650,000

It will be seen by the above statement that all the fry were deposited in the Miramichi and Sevogle rivers, with the exception of 75,000 which were applied for by the 'Pleasant Lake Fishing Club' and by 'The Shediac River Fish and Game Club.' It was considered advisable to omit all the small streams in which comparatively small quantities of fry were planted in past years, and to confine operations to the larger and more important rivers. The plan of liberating large quantities of fry in the main streams, it is believed, will prove just as beneficial, and be less costly than carrying small lots to the planting grounds on all the small streams, as has heretofore been done. There are exceptions to this plan where good results can be obtained by planting small lots from year to year. For instance, Pleasant lake in which very few fish of any kind were found a few years ago, now affords splendid angling, resulting from the planting of fry

SESSIONAL PAPER No. 22

from this hatchery, but the idea, that in order to benefit the small streams that are tributaries of a large river, that a quantity of fry must be planted in each, as has been done here in the past, is erroneous, and in my opinion these streams will be just as much benefited by planting the fry in the main river into which the smaller rivers empty. As previously stated, this plan was adopted this year, and I may add that all the fry were planted in splendid condition, under the supervision of the assistant officer.

After distribution was completed, the usual work of varnishing the hatching troughs and trays was performed, and the interior of the hatchery put in as good condition as possible.

Although the interior of the hatchery is not in as good condition as it should be, it has been decided not to expend any great amount on repairs this year, but only to have such work done as will insure the coming season's operations to be as successful as heretofore.

The necessity of improving and enlarging this hatchery is great, and I will only state here that although the hatching and distributing of over $1\frac{1}{2}$ millions of fry annually has been successfully accomplished, it has been performed under a great many disadvantages, as the building is old and dilapidated, constantly requiring slight repairs, also badly lighted, and the troughs and tanks not arranged in the manner that experience has taught will give the best results with the least danger of loss. I may also add that the importance of the salmon fishing of this river and bay would justify the erection of a hatchery with fully twice the capacity of the present one. Three millions of fry could be hatched at very little more expense than incurred for the present output. There is no difficulty in obtaining all the parent fish required only a short distance from the hatchery, and the necessary accommodations for retaining them until spawning time can be very easily arranged.

For the purpose of obtaining the required supply of parent fish this year, two stands of nets are now in operation, and although no fish have yet been placed in the retaining pond, the indications are that no difficulty will be experienced in obtaining a full supply.

In conclusion, I may say that another very successful season has been experienced by the fishermen and anglers on the rivers in this section. The catch easily surpasses any that has been made during the last twenty years. Salmon entered the river early in May and continued very plentiful until the fishing season closed. In conversation with one fisherman who operates his nets about twenty miles down river from where the hatchery is situated, he informed me that he procured over 5,000 fish from his own nets in two months. This was not an exceptional case this year, as all the fishermen from Tide Head to the mouth of the bay had catches far above the average. The anglers on all the streams made very large scores and I have been informed by many of these gentlemen that they never before saw such numbers of salmon and grilse in the headquarters of the rivers. Some of the guides say that in many comparatively small pools anywhere from 100 to 200 salmon could be seen. The same is reported from all the rivers. The guides also state that good fishing could be obtained this year on some streams where in past years only on very rare occasions a salmon could be found. Immense numbers of grilse also entered the rivers during the month of July. This will tend to show that the future supply of grown salmon is assured.

On the whole, the salmon fishery was never in better condition, and more profitable to those engaged therein than at present. This is certainly a great encouragement to continue the work of planting as large a number of fry as possible every year, in order to assist nature in keeping up the supply to meet the increasing demands that are annually made upon our fishery. Fish-breeding has become very popular with the fishermen and anglers in this locality, and they appreciate the good done them by the government in operating the hatcheries, and look forward to the time when this establishment will be so improved, that the output of fry will be greatly increased.

I am, sir,

Your obedient servant,

ISAAC SHEASGREEN,

Officer in Charge.

6-7 EDWARD VII., A. 1907

20. SHIPPEGAN HATCHERY.

SHIPPEGAN, August 16, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to report on the operations of this hatchery during the past season. Female lobsters were not as plentiful as last year, which may be attributed to stormy weather which prevailed all through the lobster season. However, the collection of eggs amounted to nearly one hundred millions and the output of young lobsters to seventy millions. The first appearance of young lobsters occurred on the 15th June, and the last distribution was made on the 11th July, when operations ceased for the season. The interior of the building has been cleaned and put in readiness for next year's work.

I have the honour to be, sir,

Your obedient servant,

SEBASTIEN SAVOY,

Officer in Charge.

21. SHEMOGUE LOBSTER HATCHERY.

CAPE BALD, N.B., Sept. 13, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit the fourth annual report of the Shemogue lobster hatchery, and in doing so I am pleased to say that we have been very successful.

The first spawns came in the 31st of May, and we closed on the 28th July, the hatchery being in operations 59 days, with this short season we have put out 122,000,000 of healthy young lobster fry. We delivered these on the usual ground, from Cassey Cape light, west, to Cape Tormentine, east, a distance of about 40 miles; we collected the eggs within these limits.

The lobster factory which I visited made good fishing, of hard shell lobster in June, but much more so in July when the shells got softer, they came in very plentiful, but of smaller size, and it is the general belief that the hatchery has produced 40 per cent of this year's fishing. I have looked after the hatchery business as well as possible, as my report will show.

We have laid wire fence around hatchery lot, also painted the buildings, and pipes, tanks, &c., ready for next season.

I am, sir,

Your obedient servant,

NAP. S. LEBLANC,

Officer in Charge.

22. BEDFORD SALMON HATCHERY.

BEDFORD, N.S., August 29, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I beg to submit my annual report on the operations of the Bedford Salmon hatchery during the past season.

In October last, I procured at Phinneys pond, Spa Spring, Annapolis county, 125,000 speckled trout eggs; and early in November obtained at the Carleton retaining pond, St. John, N.B., about 1,120,000 salmon eggs, all of which were carefully laid down in the hatching troughs here.

At the time the trout were spawned the water in the pond was very low, the fish were far from being lively, and the eggs taken from them were not all perfect, consequently about fifty per cent became sterile.

Of the 1,120,000 salmon eggs, one million fry were successfully hatched and planted in the following rivers:—

Salmon Fry.

80,000.....	Bear river.....	Annapolis Co., N.S.
30,000.....	Milville river.....	" "
200,000.....	Pennant ".....	Halifax "
200,000.....	Nine Mile river.....	" "
200,000.....	Little Salmon river.....	" "
190,000.....	Indian ".....	" "
100,000.....	Sackville ".....	" "

Total. 1,000,000.

The speckled trout were planted in the following named waters:—

Speckled Trout.

5,000.....	Kidsons lake.....	Halifax Co., N.S.
5,000.....	Lochaber ".....	Antigonish "
5,000.....	Barren ".....	Colchester "
5,000.....	Folleigh ".....	" "
5,000.....	Armstrong lake.....	Hants "
5,000.....	Fales river.....	King's "
5,000.....	Croskills lake.....	Annapolis "
5,000.....	Mersey river.....	" "
5,000.....	Bear river (East Branch).....	" "
3,000.....	Phinneys Pond.....	" "
3,000.....	McGregor's lake.....	Pictou "

Total.. 51,000

Salmon Trout (from Ottawa).

10,000.....	Long lake.....	King's Co., N.S.
10,000.....	Aylsford lake.....	" "

The distribution of fry commenced on the 14th of May and was completed on the 14th of June.

6-7 EDWARD VII., A. 1907

During the past season large quantities of salmon, from the four lb. grilse to the 20lb. mature fish have been captured along the Nova Scotia coast, and quite a number have been taken by fly in rivers where salmon have not been caught for years, and recently stocked from this hatchery.

A number of unsolicited letters have been written me concerning the success of stocking depleted rivers, amongst them are some from Mr. F. B. Gerrard, superintendent of the Commercial Cable Co. Hazel Hill, D. Carmichael, and F. G. Burstal, electricians, all of whom are active sportsmen and take great interest in our fisheries.

These letters, which I herewith inclose, refer particularly to Cole Harbour river, Guysboro county.

Large quantities of salmon, both grilse and mature fish have been playing in the Bedford basin this season, 80 have been caught in nets, and quite a few have taken the fly in Sackville river, and anglers are well pleased with our efforts to restock this river.

The hatchery is in a good state of repair. The usual cleaning, renovating and painting is being performed. The grounds and premises are kept neat and tidy, attracting the attention of all persons who visit Bedford.

I am, sir, your obedient servant,

ALFRED OGDEN.

COOEE COFFRE, GUYSBORO Co., N. S., July 16, 1906.

ALFRED OGDEN, Esq.,
Bedford, Halifax Co., N. S.

DEAR SIR,—You will be pleased to learn the efforts made during the years 1901–2–3–& 4 to restock Cole Harbour river with salmon, the fry being obtained from your hatchery, has proved very satisfactory.

During the past three weeks, anglers report having killed a number of fish in the river, also the fishermen at Cole harbour have been taking them in their nets. They say these fish are somewhat different from the salmon usually caught there. This afternoon, I had the pleasure of landing a beauty from the upper pool in the falls.

As you are no doubt aware, this stream is an excellent breeding ground for sea trout, consequently you will appreciate what a valuable addition has been made to the fisheries of Cole harbour.

Yours respectfully

D. CARMICHAEL.

HAZEL HILL, GUYSBORO Co., Aug. 23, 1906.

ALFRED OGDEN, Esq.,
Bedford.

DEAR MR. OGDEN,—I am delighted to tell you that the benefit of stocking the Cole Harbour river with salmon fry has been very clearly demonstrated in the rod fishing results on the upper waters of the stream this season.

Quite a number of salmon have been captured of over three pounds, and many more have been seen,—aye even hooked,—needless to say the latter have invariably been of much larger dimensions than those actually landed.

The members of the Eastern Angling Club, who assisted in the distribution of the fry, are much pleased to find that the efforts to improve the salmon have been so markedly successful. We extend our hearty congratulations to you upon the result, and trust you may find it possible to continue your good work in this direction in the coming spring.

Yours very truly

F. B. GERRARD,
President, Easton Angling Club.

SESSIONAL PAPER No. 22

HAZEL HILL, Aug. 23, 1906.

ALFRED OGDEN Esq.,
 Superintendent Fish Hatchery.
 Halifax, N. S.

DEAR SIR,—It is with a great deal of pleasure that I wish to inform you of the apparent beneficial effects of the department's and your endeavours to improve the rod fishing in our rivers. Several years ago you commenced by sending us some fry for the purpose of stocking the rivers in this section of country and whilst up to the present season I personally have not caught or struck any fish that I could possibly say were the result of such stocking, still I have heard of several who have had such luck.

But this season I was successful in landing three salmon, otherwise grilse, one morning in the river above tidewater at Cole harbour, Guysboro county, weighing six pounds each, and which I am satisfied were the result of the fish sent there by the department and yourself.

I give this testimony in the interest of the stocking and preservation of our river fishing in Nova Scotia.

I think that if work in this direction were continued we should soon have our rivers equal to any on the continent of America.

Yours truly,

F. G BURSTALL.

27. WINDSOR HATCHERY.

WINDSOR, August 23, 1906.

Prof. E. E. PRINCE,
 Dominion Commissioner of Fisheries,
 Ottawa.

SIR,—In making my first annual report on the operations conducted at this hatchery during the past season, I am pleased to state that the hatching and distribution of the Atlantic salmon eggs was most successful.

The eggs were received through an officer from the hatchery on the Miramichi river who attends to the placing of the same in the hatching troughs and gave me advice as to their care.

During the season some inconvenience was experienced from sediment but no injury was caused to the eggs. The fry were distributed under the directions of Inspector Finlayson and placed in the following rivers :

Meander, Hants Co.....	110,000
Avon, ".....	155,000
Kennetcook, ".....	50,000
Gaspereaux, King's Co.....	60,000
Cornwallis, ".....	50,000
Great Village, Colchester Co.....	50,000
De Bert, ".....	50,000
Folley, ".....	50,000
Total.....	575,000

An experiment was made in the hatching of shad, but, notwithstanding the indefatigable efforts of the officers having this work on hand, the high temperature of the water supplying the jars in which the eggs were placed caused a premature hatch, the young fish being too weak to rise in the incubating jars. Respectfully submitted.

I am, sir, your obedient servant,

FRANK BURGESS.

6-7 EDWARD VII., A. 1907

24. MARGAREE HATCHERY.

N. E. MARGAREE, N.S., August 29, 1906.

Professor EDWARD E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—In compliance with recent instructions I herewith submit the annual report of the fish-cultural operations conducted in Margaree hatchery during the season of 1905-06.

On October 26, 1905, I proceeded to Carleton retaining pond, St. John, N.B., to procure the necessary quantity of salmon ova for the season's operation. On November 8, I arrived at the hatchery with 1,072,000 fertilized ova, which were without delay removed from the transportation cases and placed in the incubation troughs. Having abundance of space, and for reasons best known to the pisciculturist, a lesser number of ova were carried on each tray than past years. We were troubled less with *fungus*. This fact and better general results is attributed in part to that. The average daily temperature of the water was higher than usual, consequently hatching commenced earlier, and were concluded about April 15. The resultant fry, vigorous and healthy, numbering 910,000, were planted during May and June in the following rivers and streams, namely:—

DISTRIBUTION OF FRY.

Stewart's brook, Margaree river, Inverness Co.	25,000
Big Intervale " "	75,000
Sugar Loaf " "	50,000
Black Rock " "	25,000
Tingley " "	50,000
Greig's " "	100,000
Hatchery " "	50,000
Hatchery brook " "	50,000
N. E. Margaree " "	100,000
Cranton's Ferry " "	50,000
Phillips' " "	50,000
Rossville " "	75,000
Cheticamp, Little river " "	150,000
Middle river, Victoria Co.	30,000
Baddeck " "	30,000
	<hr/>
	910,000

It will be noticed that fewer rivers were stocked this season. This is following the suggestion made by the Superintendent of Fish Culture, in his last annual report, where he recommends the discarding of the system of stocking indiscriminately and inaugurating the system of stocking by localities. The Margaree and Cheticamp, the leading and most important salmon rivers of Cape Breton island, mainly received the output of the hatchery. It is hoped during succeeding years to stock other streams in a similar manner. I am convinced that the very best results will follow this system of stocking.

I am pleased to be once more in a position to report the good work being done by this hatchery. At the inception of the artificial propagation of salmon here, in 1902,

SESSIONAL PAPER No. 22

and since, very strong opposition was offered to the work. We were informed that we would never see any good results. But last year the first results were visible. For twenty years salmon were never more plentiful. The majority were convinced. A few would not yield but maintained that last year's results were accidental, and would not be continuous. But the last is simply eclipsed by the present season, which is truly a 'record breaker.' Since the opening of the season it is no exaggeration to report that the Margaree pools are teeming with fish, if perchance the angler has not had success, the fault lies generally with himself. Large numbers of sportsmen have fished its pools with wonderful success, among the number several celebrities, led by William Travers Jerome, New York's District Attorney.

At present I am having the buildings renovated, the supply tank, troughs, trays, and cans varnished, and fixtures placed in readiness for a new supply of ova.

All of which is respectfully submitted.

I have the honour to be, sir,

Your obedient servant,

A. G. CARMICHAEL,

Officer in Charge.

25. BAY-VIEW LOBSTER HATCHERY.

Pictou, August 23, 1906.

Professor E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I beg leave to submit my report of operations at Bay-View Lobster hatchery for the season of 1906.

I commenced to get the hatchery ready for operation on April 23, one week earlier than last season.

I started the steam pump on May 7, with 7,000,000 of eggs in the jars, and with the aid of a steamer I collected ova from five canneries up to June 19.

Female berried lobsters were very scarce this year, and I was only able to fill 270 jars, or 50 jars short of the capacity of the hatchery.

This season was very cold and stormy and the fishermen missed a good many hauls during the season.

The eggs were delivered to the hatchery in good condition and hatched out very successfully.

The fry appeared first in the tanks on June 20, and hatched out very rapidly. 100,000,000 fry were distributed between Pictou island and the mainland, and around Gull Rock. 18,000,000 were also distributed between Merigomish, Arisaig and Cape George.

The frequent storms this year gave us a lot of work in caring for the eggs, by bringing in a lot of mud which could be remedied by having the supply pipe extended further out into the channel.

During the season, with authority from the department, I had the steam connections and valves renewed on the boiler. I also pointed the outside of the salt water tank, and repaired the curbing of the wells. This season being wet our wells gave us a good supply of water for the boiler.

Last September the entire covering of the wharf was renewed, it is now in good repair, and under ordinary conditions should last for many years.

The galvanized inner waste pipes will have to be renewed before we commence operations next season, but repairs to the hatchery will be very light next year.

The hatchery was closed on July 11, after the necessary cleaning and painting.

I have the honour to be, sir,

Your obedient servant,

W. F. HARRIS.

6-7 EDWARD VII., A. 1907

26. CANSO LOBSTER HATCHERY.

CANSO, N.S., August 30, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa, Ont.

SIR,—I beg leave to submit my second annual report of operations at the Canso hatchery for the season of 1906.

Having some preliminary work about the inside of hatchery I opened it on April 2nd so as to be ready to receive the ova as soon as fishing began.

On 19th we began operations, but owing to it being such a backward spring there was not much fishing done in April. On 30th the steamer began collecting ova and visited the factories about Tor Bay, White Head, Canso and Queensport.

We collected 95 millions of eggs and had them delivered at the hatchery in good condition.

We hatched 71 millions of healthy, young fry and distributed them around the waters of Tor Bay, White Head, Canso and Queensport.

Fishermen are taking great interest in the hatchery here since seeing its practical working results; they think it is a grand thing and very much needed to replenish the lobster fishery, which has for the last few years been falling off.

I have the honour to be, sir,

Your obedient servant,

JAMES MEAGHER,

Officer in Charge.

27. FOURCHU LOBSTER POND.

LOUISBURG, C.B., NOVA SCOTIA, September 18, 1906.

Professor E. E. PRINCE.
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I beg to submit my report as the officer appointed to supervise H. E. Baker's seed lobsters pound at Forchu, N.S., for the year 1906.

The first seed lobsters were deposited in the pound on the 14th May.

The lobsters taken in pound from the 14th May to the 30th June, with the exception of about 3,000, were removed and placed in the waters off the Richmond county coast the sixth and seventh days of July. The lobsters were in good condition.

Lobster fry was first seen in the pound on the 18th July, and from then to the date of the final removal fry was seen daily in and around the pound. They do not stay in the vicinity of the pound but can be seen swimming towards the ocean shortly after being hatched. On the third and fourth of August all of the lobsters were replaced in the waters off Cape Breton and Richmond counties, care being taken to replace the quantities of lobsters as nearly as possible in the waters from which they were originally taken. All of the lobsters this season were in exceptionally good order and condition when taken out of the pound.

The death rate was considerably less than in former years. In May and June it did not exceed two per cent, and in July a fraction over three per cent.

The weather during this season has been colder than usual, and the temperature of the water was considerably less than the preceding years, which accounts to some extent for the low death rate. Also, the lobsters were handled more carefully in the fishing smacks while being conveyed from the fishing grounds to the pound.

The condition of lobsters at time of removal was as follows. viz.: Eleven per cent eggs hatched, thirty-five per cent pale, light coloured eggs, advanced, the balance were in different stages of development, principally dark and green coloured, and would not hatch for some weeks. The sizes were from eight to twelve inches, principally from nine to eleven inches. We had a few fully developed lobsters with eggs seven and seven and half inches.

The catch of all kinds of lobsters on this coast has been under the average, the quantity of seed lobsters caught was considerably less than during the previous seasons.

SESSIONAL PAPER No. 22

It is too soon for the fishermen to feel the effect of the pound at Fourchu, N.S., by increased catch of lobsters, as it has not been in existence long enough for the young lobsters to grow large enough to be caught. I look for considerably larger captures on this coast in a couple of years as a result of the mother lobsters having been taken care of and allowed to develop their young in a natural way.

Everything I have written in my previous reports in connection with the pound for seed lobsters at Fourchu, N.S., I again confirm.

I am, sir, your obedient servant,

H. C. V. LEVATTE,

Fishery Officer.

28. KELLY'S POND HATCHERY.

KELLY'S POND, P.E.I., June 2, 1906.

Prof. E. E. PRINCE,

Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit to you my report of last season's work at Kelly's Pond hatchery. On November 9, Inspector Finlayson of the Department of Marine and Fisheries placed in the hatchery 800,000 salmon eggs. For the first two months we were very much troubled with muddy water which necessitated a great amount of washing. However I am happy to say it did not injure the eggs in the least. On February 9 the eggs began to hatch; on March 24 we emptied the trays into the troughs. At least 90 per cent of the eggs were successfully hatched out and distributed in the following rivers, viz.:—

Morell	200,000
Winter river.....	300,000
Wheatley river.....	100,000
Dunk river.....	100,000
Mores river.....	20,000

In the last four mentioned rivers we did not see a single dead fish, but in Morell there were a few that were not as lively as I would like. The hatchery and the dam are in a very good state of repair, but my assistant's house and the hatchery would be very much improved by having another coat of paint.

I have the honour to be, sir,

Your obedient servant,

A. W. HOLROYD,

Officer in Charge.

29. BLOCK HOUSE POINT HATCHERY.

BLOCK HOUSE POINT, P.E.I., July 10, 1906.

Prof. E. E. PRINCE,

Dominion Commissioner of Fisheries, Ottawa.

SIR,—I beg to submit my report of the work done at Block House Point hatchery for the past season. The hatchery opened for work on the 9th day of May. For the first three weeks the weather was very stormy, consequently it was impossible for the tug to make regular trips. The percentage of spawn lobster was unusually small, therefore we did not get as much spawn as last year, but I am pleased to say it hatched out splendidly. We had no dead lobsters or bad spawn in the hatchery. We distributed ninety millions of young lobsters in the following places, viz: Canoe cove, St. Peter's island, Governor's island, Governor reef, Holland cove and at the entrance of Ch Harbour. During the summer there has been a coal shed and sleeping house built for the men.

The hatchery and buildings are in good condition.

I am, sir, Your obedient servant,

A. W. HOLROYD,

Officer in Charge.

ANNEX C.

REPORT ON OYSTER CULTURE BY THE DEPARTMENT'S EXPERT FOR
THE SEASON OF

1906.

C. G. S. 'OSTREA' SHEDIAC, N.B., October 1st, 1906.

Professor E. E. PRINCE,
Dominion Commissioner of Fisheries,
Ottawa.

SIR,—I have the honour to submit to you my report on oyster culture of this season's work to date in Prince Edward Island and New Brunswick.

On the 14th May I received instructions from your department for the *Ostrea* to patrol the coast between Cape Tormentine and Chockpish on the New Brunswick shore, to prevent lobster lines and gear being placed in those waters before the 25th May in that district; this was effectually carried out, Fishery Officer James Noonan being on board during the time we were patrolling between Cape Tormentine and Shemogue. On the 25th May returned to Charlottetown, where I coaled, watered and provisioned steamer, but owing to bad weather was unable to leave until the 1st June, when I sailed for Malpeque, P.E.I., arriving there on the 5th instant.

Malpeque.

On my arrival I was met by Fishery Officers Davison and Forbes and spent the remainder of the week with them at Grand river and Bideford river, settling disputes among the quahaug fishermen. In the following week, I commenced raking on the oyster beds in Richmond bay and continued to do so while weather permitted until the 20th July, when I considered it advisable to discontinue my work, as I had been watching the oysters and found they were nearly ready for spawning. Raking over the grounds in the spring months cleanses the beds, by removing seaweeds and eel-grass, it turns over the loose shells and disturbs the sediment, which is carried away by the tides, leaving the beds clean, as on the opening of navigation they are in a dirty state, for they have laid dormant all the winter, covered over with ice and no action of the sea to disturb the bottom until a thick sediment has settled over the whole area; this I know from actual experience. The grounds require to be worked on before the spatting season arrives which does not take place as a rule until late in July as the temperature of the water has not become sufficiently warm until the above date, and it is positively necessary for some such work to be carried on to cleanse the grounds, if one desires the spat to find a favourable resting place. Most of the work was done on a very large bed situated off Little Curtain island, but when it was too windy and rough to remain on that bed, I hauled the rakes over the whole oyster area in the bay, by going up to the head of the bay, thus taking advantage of all the areas I could.

After finishing this work I patrolled the bay with Fishery Officer Forbes on board to see that all lobster gear was taken in. This was done satisfactorily.

SESSIONAL PAPER No. 22

I then made an examination of Grand river in which Mr. D. Forbes gave me valuable assistance, when the following areas were laid off for mud digging purposes to the satisfaction of both fishermen and farmers. I have described them as follows, giving the local names and places which are known to all the residents:—

No. 1. The first one in Grand river is on lot 14 side, called the Long mussel bed lying off Thompson's cove, Lot 14, to Kingsland point, Lot 16, reserving the ell on the south side or edge for oyster fishing. This bed is approximately about thirty-five acres in extent with mud varying from 14 to 20 feet deep.

No. 2. McLéan's bed on Lot 14 side, lying off John McLean's shore east of the road between the Priest's farm and John McLean's farm. This is a large bed where mud has been dug in the past.

No. 3. This is a large bed on Lot 16 side, off Alec. McNeill's shore, known as the Alec. Kenneth bed.

No. 4. Is a large bed on Lot 14 side known as the Bell or wharf bed close to the old wharf.

No. 5. Is a large mussel bed on Lot 16 side known as the McLaren Point bed lying off McLaren's point.

No. 6. This is a large bed lying just to the westward of Grand river ferry wharfs. This is a hard bed and an obstruction to navigation; and all the beds lying east of ferry wharfs, three or four in number, the lowest being about two miles below the ferry and a little to the eastward of Big Marsh shoals.

These are all large beds with deep mud, and will last for years, and the above description is sufficient as they are all locally known.

While writing on this subject I might suggest that a more systematic form of mud digging be adopted, as the areas are becoming more limited each year; by removing the mud from the area clean and even, but as it is now, a man digging for mud strikes out in the longest direction leaving lumps and hummocks all over the bed. If the area were dug out clean, this ground might afterwards be converted into another oyster growing area which would last for ages, now it is only an obstruction to navigation where the cuts fill in with soft mud. This could be followed out if the areas to be dug on were staked by the mud diggers before navigation closes, but at the present time there is an unwritten law among mud diggers, that staking of the ground is not allowed and the first man to cut ice and place his digger in position has the right to the best cut on the bed, but I have no doubt that some arrangement might be made so that the bed once dug on should be entirely removed to a sufficient depth and an even bottom. This finished my work in Richmond bay and on the 2nd August I sailed from Malpeque, arriving at

The Brae.

on the 3rd, when I examined the mud digging areas in dispute and gave the following privileges to the satisfaction of all concerned by striking a line across Brae harbour from Alexander Milligan's west line fence on the north side of Harbour bay, to the inside point of the sandhills on the north-east side of Brae island; all to the westward of this line to be granted for mud digging purposes. This is practically all the mud available in the harbour; there are one or two small patches with little depth which have been applied for, for cultivation; they are utterly worthless to dig on, and will soon be muddied over, unless a little attention is given to them. I sailed from the Brae on the 5th August, arriving in Charlottetown on the 6th inst.

Lobster Patrol.

On my arrival at Charlottetown I found instructions to proceed to Shediac at once, as the clam fishermen were encroaching on the oyster reserve. I patrolled the bay for a few days and was getting ready to rake over the bed here, when I received instructions to proceed to Cape Tormentine and patrol the coast for illegal lobster fishing. On my

6-7 EDWARD VII., A. 1907

arrival I was met by Fishery Officers Copp and Noonan, the latter accompanying the *Ostrea* each day she was out; I succeeded in destroying ten back-lines and traps in the vicinity of Cape Tormentine and Baie Verte, also eight lines and traps off Cape Bald; returning to Shediac on the 8th September, the weather being very wild and unsettled during the time I was there.

Shediac, N.B.

On the following week I commenced to rake over the beds in Shediac bay and am still doing so at the time of writing. On examining the Wilbur bed I made three hauls of the dredge with the following results: *1st haul*, 21 large 14 small, *2nd haul*, 35 large 20 small, and *3rd* 58 large and 25 small; I have not yet examined the other beds, but will do so after finishing cleaning this one.

Quahaugs or Hard Shell Clams.

While in Grand river I saw that a great deal of harm had been done to the oyster beds by the quahaug fishermen, who use the long single toothed rake for this purpose, which should be prohibited on oyster beds, as it comes up full of soft black mud. This is washed off before the clams can be picked out, this causes a thick sediment carried by the tides to settle on the oyster beds, giving the oyster spat no chance whatever of finding a resting place, and the amount of mud disturbed in this way is sufficient to choke the parent oyster. I have always maintained that it was detrimental to the oyster industry to fish clams after the close season for oysters had commenced. And as so much trouble is caused by the clam fishermen working on oyster beds during the oyster close season, I would strongly urge the department to take immediate action in placing a close season on hard shell clam fishing. It is now becoming scarce in some localities, and the sooner action is taken the better it will be for the industry, as it is a valuable one and should be preserved.

Tongs and Rakes.

For a number of years the tongs with teeth not more than three inches in length have been used with great success in Prince Edward Island and do not injure the beds, the single-toothed rake with teeth nearly a foot long break the crust of the oyster beds causing mud and sediment to find a resting place which is very detrimental to the beds. The single-handled rake and mechanical tongs or grappels, (an American invention) hoisted to the surface of the water with a winch, should be prohibited by law from being used on our oyster beds.

Transplanting small Oysters.

During some seasons the oyster spat fall more heavily than others, and there are several shallow natural resting places where young oysters are found, the spat being carried there by the tides, can be easily picked up, especially around Curtain and Ram islands, Richmond bay. If arrangements could be made for these small oysters to be picked up in the spring of the year and transplanted to some of the natural oyster beds lying in deeper water, it would be a great advantage to this fishery in general, as these small oysters do not mature as a rule, but are killed by the frost and ice during the second winter if not removed and placed on areas by other persons. Large quantities have been picked up from time to time by individuals and laid on private areas, but that is of no material advantage to the general public, and if some system like the above could be arranged it would certainly be an advantage to all concerned in the industry.

I have the honour to be, sir,
Your obedient servant,

ERNEST KEMP,
Oyster Expert.

SESSIONAL PAPER No. 22

EXTRACTS FROM A PAPER ON OYSTER CULTURE, READ AT THE BOARD OF TRADE ROOMS, CHARLOTTETOWN, ON 23RD MARCH, 1906, BY CAPTAIN ERNEST KEMP, DOMINION OYSTER EXPERT.

Oyster culture is a subject which covers a great deal of ground, as it is conducted in so many various ways according to the country and locality in which it is prosecuted. A general idea of these different systems will not be out of place if I briefly mention some of the methods in which it is carried on abroad before making any suggestions, as to what should be done in the maritime provinces. We all know the waters around us are admirably adapted for the cultivation of these delicious bivalves, as they are growing naturally from the Bay des Chaleurs, along the New Brunswick and Nova Scotia shores, rivers and bays, as far as the entrance of the Strait of Canso, in the waters of Cape Breton, and last but not least, all the waters of Prince Edward Island; how much more so, would be, the output of this extent of territory if all the available water space were occupied by private culturists, it is not for me to say.

I would like to convey to the mind of the culturist, certain things to be carried out and others to be avoided, in order to make his labours a success, so will first make a few remarks on

Oyster Culture in England.

I was brought up among oysters and my intimate connection with the Whitstable Oyster Company, of which I am still a member and where I gained most of my practical knowledge and experience, will enable me to bring to your notice a few facts connected with the industry.

No artificial means are used by the above company on account of the exposed situation of the beds, being nearly four miles off shore. The system of dredging with sail-boats is carried on to catch the supply for market, and clean the grounds by moving the cultch or loose shells, and removing weed, starfish, dogwhelks or borers as they are called here, or any other marine enemy of the oyster, also to transfer oysters from one bed to another; the constant dredging keeps the shells in a clean condition, and periodically shells are scattered over the beds to catch the spat. The area is about one and one-half square miles in extent and is divided into sections or beds, different grades of oysters being placed in each particular section, there is one place for marketable oysters, another for half-grown, another for the small, and so on. The fishermen are informed of the quantity and quality they are to catch, each day they go to work on the grounds. These oysters are taken to the company's warehouse where they are culled and shipped to all parts of England and the European continent, as they may be ordered; no oysters are sold on commission for what they will realize. The price is fixed by the company, and very little change is made after it is once fixed for the season.

The oysters sent to market are all of an uniform size, whether it is large or small, according to the grade or quality.

Very little, if any poaching is carried on by the outside fishermen in English waters. At one time some of the ordinary fishermen were strongly opposed to the scheme, where companies applied for concessions, but after these companies became established in many cases it was found to be of great benefit to them, as it opened up a ready market for their catch of oysters, whether young or old, and often they would find employment by hiring themselves and their boats to the oyster growers, where their time would be taken up in cleaning and cultivating the grounds, also catching oysters for market when the trade was brisk, so that the apparent loss of a small area of ground which was entirely useless to them, but where they would occasionally try to fish eventually became a source of employment to many of them with regular wages.

Should any poachers be caught in the act, they are severely dealt with at the hands of justice, either by paying heavy fines or imprisonment. To prevent raids being made by poachers on these valuable grounds a staff of watchmen are always on hand for both day and night work. Dogs are often trained on these watch boats to bark as soon as a boat or vessel comes within the limits of the grounds or is sailing by. These means all tend to keep marauders at bay. Creeps or grapnels are sometimes used; they

6-7 EDWARD VII., A. 1907

are attached to chains and spread over the areas, which would catch a dredge if it were hauled over them. Prevention is better than cure. * * * *

In France the method is somewhat different, as the weather is so much milder and frost is not sufficiently felt to hurt their undertakings, and it is entirely artificial, tiles are used dipped in a solution of sand and lime, forming a rough coating of cement for the oyster spat to adhere to, they are then arranged in layers or in tiers laid crossways, these tiles are not flat but long and rounded, so formed that the spat might adhere to both sides of it.

After the spatting season is over they are carefully inspected, and if the spat had adhered, the tiles were sometimes placed in deeper water until the following spring, when the young oysters are stripped off, by means of a knife or chisel made for the purpose. They are then placed in trays for a short time and afterwards deposited in clairs, pits or other areas allotted for them. Of course this method is impossible in this country owing to the severity of the winters, but I thought it would be useful to know how it is done.

The clairs, which are used chiefly for fattening and greening purposes (of which the French are so fond), are diluted with a little fresh water, and are kept more stagnant than the ponds which are used for growing purposes. Parc owners affirm that the smaller the quantity of water there is in a clair, the oysters, being more exposed to action of light and heat, consequently grow with greater rapidity.

In the parc at St. Joseph's in France, which are most exposed to the inclemency of the weather, the oysters are turned, and laid on their flat sides. This ingenious arrangement renders the animal less accessible to the action of the cold, and gives the shell a firmer position, thus preventing it from being too easily lifted by the surf, and from being thrown to a distance by the violence of the sea.

Oyster Culture in the United States.

Oysters are to be found on nearly the whole length of the coast line, in some places more plentifully than others. There is such a vast area of water suitable to the natural conditions of the oyster and the demand being so great the grounds are divided into two parts, one being the public or natural bed of the State, and the other consists of areas of ground brought into cultivation by owners and companies who devote their time and spend large sums of money in order to bring these grounds into a high state of cultivation. After that is done, the first expense being the heaviest, the grounds are kept clean, and oysters are obtained for market at the same time. Oysters are considered so cheap and plentiful that they are eaten by all classes; they are also exported in large quantities to the European market and also to the Pacific coast for planting purposes.

Oyster farming in America, which presents some features of resemblance to the French system, and also many differences, has grown up as the result of private enterprise, without any help or any direct encouragement from the government.

Several years before Coste and De Bon commenced their experiments, the oystermen of East River, having observed that young oysters fastened in great numbers upon shells which were placed on the beds at spawning season, started the practice of shelling the beds in order to increase the supply; and in 1855, or three years before Coste represented to the French Emperor the importance of similar experiments, the state of New York enacted a law to secure to private farmers the fruits of their labour, and a number of persons engaged in the new industry on an extensive scale.

In portions of Long Island Sound, especially off New Haven, it has been needful to make a crust or artificial surface upon the mud before laying down the shells. This is done with sand.

The following account of the method of laying out and stocking a deep-water oyster farm in Connecticut, and the statement of the attendant expenses, is copied from Ingersoll's 'Report on the Oyster Industry of the United States':—

'It is thought hardly worth trying unless at least fifty acres are obtained, and many of the oyster farmers have more than one hundred acres. These large tracts,

SESSIONAL PAPER No. 22

however, are not always in one piece, though the effort is to get as much together as possible. He obtains the position of the ground, as near as he can, by ranges on the neighbouring shores, as described in his leases, and places buoys to mark his boundaries. Then he places other buoys within, so as to divide his property up into squares, an acre or so in size. In this way he knows where he is as he proceeds in his labours. Having done this he is ready to begin his active preparations to found an oyster colony.'

Preparations.

'When a cultivator begins the preparation of a deep-water farm, his first act is to scatter over it, in the spring (about May), a quantity of full sized, healthy native oysters, which he calls 'spawners.' The amount of these that he scatters depends on his circumstances; from thirty to fifty bushels to the acre is considered a fair allowance here, I believe. The rule is, one bushel of spawners to ten bushels of cultch. He now waits until early in July (from the 5th to the 15th is considered the most favourable time), when he thinks his spawners must be ready to emit their spat. He then employs all his sloops, and hires extra vessels and men, to take down to the harbour the tons of shells he has been saving up all winter, and distribute them broadcast all over the whole tract of land he proposes to improve that year. These shells are clean, and fall right alongside the mother oysters previously deposited. The chances are fair for catching spawn. Sometimes the same plan is pursued with seed that has grown sparingly upon a piece of ground; or young oysters are scattered as spawners, and the owner waits until the next season before he shells the tract. Sometimes the ground must be cleaned before any preparation can be begun upon it, by elaborate dredging, or otherwise. Within the harbour, for instance, considerable muddy bottom has been utilized by first paving it with coarse beach sand. No spot where there is not a swift current is considered worth this trouble. The proper amount is two hundred tons of sand to the acre, which can be spread at the rate of five sharpie loads a day, at no great expense. The sand forms a crust upon the mud firm enough to keep the oyster from sinking, and it need not be renewed more than once in five years.

Expenses of an Oyster Farm.

In either case, therefore, the planters expense has not been enormous. Two statements are herewith presented of the outlay under the operations outlined above, which are as follows:—

No. 1.—Fifty acres.

2,000 bushels spawners at 30 cents.	\$ 600 00
15,000 bushels shells at 3 cents	450 00
Planting 15,000 bushels shells at 4 cents	600 00
Total	\$ 1,650 00

No. 2.—Sixty acres.

2,000 bushels of spawners at 56½ cents.	\$ 1,130 00
17,000 bushels shells at 4 cents.	680 00
4,453 bushels Bridgeport seed at 10 cents.	445 30
Total	\$ 2,255 30

In third case Captain George H. Townshend gave a statement of the expenses to me of starting a farm of twenty-five acres off the mouth of East Haven river. This was a more elaborate arrangement, but, on the other hand, was accomplished through a

variety of favourable conditions, cheaper than would have been possible with the ground otherwise situated.

2,000 bushels small river oysters at 25 cents.....	500 00
Spreading same and staking at 5 cents	100 00
600 bushels dredged seed at 40 cents	240 00
10,000 bushels shells, put down at 4 cents.....	400 00
Total.....	\$ 1,240 00

It would not be unfair to average the cost of securing, surveying and preparing the deep-water beds at about \$40 an acre, or about \$4,000 for one hundred acres. To this must be added about two dollars an acre for ground surveys, buoys, anchors, etc. This starts the planter in his undertaking, and if these beds are in an exposed position they are liable to suffer loss by storms, shifting sands, etc. ; if, on the otherhand, they are well protected by nature, there is the watching and attention to be given to them grounds, as the catching of the stock after it has matured, or the separating of the seed which must cost a further sum, but when once started, there are always oysters which are caught that can be marketed, so that you are killing two birds with one stone, catching the oysters and cleaning the ground.

Management of Oyster Farm.

Having secured a spat of young oysters upon the cultch which has been laid down for them, they are left alone until they attain the age of three, four or five years, according to the thrift and the trade for which they are designated, by the end of which time they have reached a large size and degree of fatness, if the season has been favourable. If, as is largely done by those planters who live at Oyster Point, the bivalves are to be sold as seed oysters to Providence river, or other planters, they are taken up when only two years old.

At any time before the end of May, the disturbance of the beds can do little harm, and the experience of the Connecticut oyster farmers shows that the thorough raking of the oyster beds, just before the spawning season, is a positive benefit. The young bivalves cannot attach themselves to dirty and slimy shells, and if all the sponges, hydroids and seaweeds could be dragged from our beds in April and May, and if the old decayed and slimy shells could be ploughed under and covered with cleaner shells from below the surface, by dredging just before the spawning season, the fertility of the beds would be greatly increased, and there is, therefore, nothing in the nature of the oyster to demand the closure of the beds in April and May.

Enough instances have been given to show that the prohibition of dredging will not save any bed which can be reached with tongs, and as the dredge is a much more scientific, effective and economical apparatus than the tongs which it has superseded, there does not seem to be any reason why its use should be prohibited. In one way the use of dredges is a positive advantage to the beds. The dead shells which are found on an unworked bed are usually so covered with sponge, slime, and other substances, that they furnish no clean surface for the attachment of spat ; and as dredging tends to turn up clean shells, to break up and scatter the clusters and to tear away the sponges and other foreign bodies, it is a positive benefit to the beds ; the teeth of the dredge take hold of the rank growth of the beds, and by being dragged through *them* loosen and give *them* room to grow and mature properly ; moreover, beds are continually increased in size, for when the vessel runs off the beds with the nets filled with oysters, the oysters and cultch are dragged off on ground where no oysters existed, and thus the beds are extended ; and when the vessel is wearing or tacking to get back on the oyster beds, the catch just taken is being culled out, the cullings thrown overboard forming new cultch for drifting spat to adhere to. Many persons who do not advocate the total prohibition of dredging, believe that the size of the dredging boats, and the size and the

SESSIONAL PAPER No. 22

weight of the dredges should be restricted by law. They give two reasons why the size of the boats should be restricted, urging that the large boats are able to work on the beds when the police boats cannot venture out, and that their size permits them to use very large dredges, and thus catch great quantities of oysters.

It is asserted that the use of large dredges causes much evil, as they ruin the beds by crushing or smothering or burying in the mud more oysters than they capture; but the private farmers of Connecticut find it to their advantage to use much heavier dredges, and their farms improve under this treatment, although very heavy dredges are hauled by steam over the beds, even in the spawning season.

The cause of the exhaustion of the beds is because the demand has outgrown the supply. There are only two possible remedies. Either we must diminish the demand by killing the packing industry, which has created it, or we must increase by artificial means the natural supply of oysters.

This industry has paid a profit of no less than 100 per cent, annually upon the capital invested in the business, while money thus invested in other states has paid an annual interest of more than 200 per cent.

One firm laid down two thousand five hundred bushels of shells. Several large growers have laid down as many as two hundred thousand bushels each. A still larger number have scattered a hundred thousand, fifty thousand, and twenty thousand each. There are about thirty steamers engaged in the business, besides a large number of sailing vessels. It does not admit of a doubt that the business of oyster growing, as carried on in the waters of the sound, is exceedingly profitable.

With regard to transplanting the oyster and its transportation, all experienced persons were of the opinion that delicacy in handling, and freedom from jars, concussions and shock of any kind, were desirable. Oysters when under hatches, have very frequently been killed by heavy thunder storms and firing of guns. Any sudden shock or concussion will prove destructive, if they are in a confined space. Oysters taken up during the summer are much more susceptible to injury from this cause than those obtained during the winter.

Oysters are transplanted at any and all seasons, but generally in the spring and the autumn.

Here is an extract taken from the New York Fishing Gazette of the 23rd of last December, which reads as follows:—

An oyster farm of 920 acres in Normini Creek pays the State of Virginia \$920 a year.

It was started three years ago, and \$10,000 has been spent in planting. The present value of the farm is estimated at \$50,000. From a ten acre farm in the Machodock, Virginia, \$2,000 worth of oysters have already been sold this year. Virginia farms are getting seed oysters from Maryland which the laws of Maryland will not permit to be cultivated in this state. Tongers in Virginia are making more money taking oysters for the planters, than they can in taking them from the natural beds.

December 30. The establishment of oyster culture in Virginia has put it ahead of Maryland as the leading oyster state. The Maryland yield has decreased from ten million, five hundred and sixty-nine thousand and twelve bushels in 1880, to five million, six hundred and eighty-five thousand five hundred and sixty one in 1901. During the same period the Virginian yield increased from six millions, eight hundred and seventy-three thousand three hundred and twenty bushels to seven millions eight hundred and eighty-five thousand four hundred and forty-seven bushels, of which about three-fifths came from the oyster farms. The comparative results as regards state revenue stand sharply out in the following table:—

1901	Maryland	\$74,974	Virginia	\$46,044
1902	"	73,359	"	51,618
1903	"	59,665	"	62,625
1904	"	39,989	"	68,028

Disbursements in 1904 amounted to \$241,202 in Virginia and \$62,628 in Maryland, a deficit of \$22,364.

Private Oyster Culture.

The maritime provinces are equally adapted for the cultivation of oysters, and there is no reason why they should not prove as successful in our waters as elsewhere. The Marine and Fisheries Department granted leases some years ago, and an interest was being taken in this branch of industry until about six years ago.

On the 31st December, 1897, forty leases were held as follows :—

Quebec	held 2 leases containing	472 acres.
New Brunswick	held 2 leases containing	74½ acres.
Nova Scotia	held 12 leases containing	74¾ acres.
Prince Edward Island	held 17 leases containing	46 acres.
British Columbia	held 7 leases containing	142½ acres.
British Columbia	Indian reservation	365 acres.
<hr/>		
40		1147¾ acres.

So a start had been made in the right direction, and I would like to see the time when all available water area is taken up and converted into private oyster beds, as it must bring in a source of wealth, perhaps small at first, but if carried on successfully it means a large item both as regard profit and labour.

The Soil.

Oysters cannot thrive where the ground is composed of moving sand, or where mud is deposited ; consequently, since the size and number of suitable places are becoming very limited, only a very small percentage of the young oysters can find a resting place, and the remainder perish. By putting down proper cultch, immense quantities of the wandering spat (or fry) may settle on it, and thus be saved.

The conditions suitable for oyster culture vary, in different localities and with different classes of oysters, but the general requirements may be said to be a suitable soil, consisting preferably of a bed of shells superimposed on hard mud or clay, an absence of sand, and of five fingers, dogwhelks, crabs and other enemies of the oyster, a tidal flow ; and a certain admixture of fresh water, varying according as the bed is required for breeding purposes, or mainly as a fattening ground. In some cases oysters grow abundantly on rocky ground, and it is impossible to say generally, without a full knowledge of the circumstances of each case, how far any area may, or may not, become a likely oyster ground.

An area with a smooth surface laying in about four or six feet at low water, or up to twelve or fifteen feet will not hurt, the water should be sufficiently deep, so as not to allow the ice to rest on the beds, but where they are covered by ice and a current of water running between the bottom and the ice, the oysters are protected from the weather and are considered safe. The shallower the water the easier the labour, but probably they would be safer from theft in deeper water.

After an area has been prepared the next step is to stock it, and it has often been observed that the removal of oysters from one ground to another has the general effect of improving both their flavour and their size. The spring of the year, before the hot weather sets in, is the best time for planting. By placing the oysters in shallow water during the spring and summer months, they will grow much faster than if placed in deeper water, as the sun causes the water to become much warmer ; the oyster being very sensitive to the action of light and heat which promotes a rapid growth. Oysters planted in the autumn are not so likely to thrive, as, owing to the change of soil and falling temperature, the oyster is not properly climatized before winter sets in, which very often proves disastrous. Oysters grow but little during the winter months, with the exception of getting thicker, consequently, it is all risk or loss, with little or no gain, although there are exceptions in every case. Young oysters taken in the spring will

SESSIONAL PAPER No. 22

have survived the winter, the change of water and temperature becoming warmer, gives the oyster every chance to live and grow.

In obtaining the necessary quantity of oysters for planting purposes, extreme care would be taken to secure them in a fresh condition, and if time will admit of it, to overhaul these oysters and brood very carefully, and if they are found to be in clusters they should be separated as much as possible, either from other oysters, shells, stones, or anything else they may have adhered to. This separation gives the oyster a better chance to grow into its natural shape, as oysters grow better singly than when in clusters or bunches. In securing the stock the size of the oyster should be considered, for which I give the following reasons:—Small or young oysters planted on a bed are preferable, as their growth alone will result in large proportionate returns and profits. A young oyster is not so likely to die when transplanted to another bed, as when older, nor is it any advantage to transplant a full-grown oyster unless for immediate use. In the oyster trade of this country one great advantage is the rapid growth of the bivalve, when, as is the case here, they are bought and sold by measure.

As a rule, oyster brood picked from an ebb-dry ground or above low-water mark, are much hardier than those taken from deeper water; and by removing them into deep water they would be secure from the heavy frosts which prevail around our shores; and the quality of these oysters is, as a rule, very good.

Great care should be taken of the spat, as the older it is, the hardier it becomes, and if the young are saved the future may be looked forward to by reaping a good harvest. The living and the dead shells of the adult oysters furnish the best surface for the attachment of the young; and for this reason the points where oyster beds are already established are those where the young have the most favourable surroundings and the best show for life. The beds thus tend to remain permanent and of substantially the same size and shape. It is well known that shell-fish of all kinds thrive best where the supply of lime is the greatest. The dead oyster shell is soon corroded and in a few years almost entirely dissolved by the sea-water, and I think this fact is another reason why the young oysters thrive best on a natural bed.

Culch is the name given to the debris of shells, stones, etc., which are found at the bottom of the sea, on or near oysters beds. It has been the practice from time immemorial to supplement the natural supply by throwing down deposits of this sort on oyster grounds. Oyster and cockle shells make the best material for this purpose; in default of this, stones and pebbles may be used, the great point being that culch, whatever it is composed of, should be clean, and for this purpose the shorter the time it is laid down before the spat falls the better.

Shells may be collected from oyster saloons and deposited near the shore, exposing them to the weather, the sun and rain, frost and snow will have the desired effect on them, they will be thoroughly cleansed of all organic or other matter, and when laid on the oyster beds are excellent spat collectors, they also serve to make a firm foundation in extending an area if required by the planter. Or they may be obtained from oyster beds, when fishing for oysters and laid on shore till required for use, or when enlarging an area may be deposited there each day as they are caught according to the discretion of those who have charge of the work.

In the United States large quantities of oysters are canned each year, and the shells are saved and returned to the water at the proper season. Another source of supply is the shucking, or opening the oysters at the packing houses, sending only the meat of the oyster to market, which is a large item saved in freight and the shells are again returned to the beds to act as spat collectors.

Oysters will spat in shallow water sooner than they will in deeper water, owing to the difference of temperature at different depths.

They will breed long before they are full grown, very probably in the first year of their age; certainly in the second. Their productiveness appears to reach its maximum at five or six years, and afterwards to decline; but much further observation is needed before any certain knowledge is acquired.

The state of the weather, however, has a serious influence on the spawn, and on the adult oyster power of spawning. A cold, wet and windy season is very unfavourable and a decidedly cold day will kill the spat, so that it will be seen that while in the embryonic state young oysters are very delicate and susceptible to cold. If the temperature of the sea suddenly drops many degrees, they all close their shells and fall to the bottom dead, just as a frosty night will 'nip up' and cause to fall off from the branches the delicate blossoms of fruit trees. If, on the contrary, the weather continues of a warm and equable temperature both day and night, and if it be at the same time calm, the young oysters will have a chance of taking up their positions on the various substances they love best, viz: stones, gravel, empty shells, living oysters, and other clean, hard substances.

APPENDIX No. 12.

ANNUAL REPORT ON BAIT COLD STORAGE FOR 1906.

NEW GLASGOW, N.S., October 1, 1906.

Prof. E. E. PRINCE,
Dominion Commissioner of Fisheries.

SIR,—I beg leave to submit to you the seventh annual report on Bait Cold Storage for the maritime provinces.

On account of the change in the financial year this report covers only nine months time.

For the past two years the erection and completion of new freezers has gone on at a most remarkable rate. It seems no difficulty now to get the fishermen to take up the scheme.

The two large commercial freezers, the one at Canso and the other at Halifax did a good business last spring in supplying the Bankers with bait. The one at Canso had over 250 tons of squid stored ; but this enormous quantity was not nearly sufficient to supply the demand. and they had to turn away many vessels which they could not supply. Squid so far has been very scarce this year. They have been reported in many sections but it has been almost impossible to trap or jig them in any large quantities.

The two large freezers of 100 tons erected at Lunenburg and Digby have rendered quite a service to both of those localities in supplying the fishermen with bait. The one at Lunenburg supplied some Bankers there also last spring. A new one of this same type (100 tons) is now under construction at North Sydney.

We are now at work completing one at Half Island cove to replace the one that was burned last fall. A new one at New Harbour, Guysboro Co., is well under way. The one at Newport Point is just about completed also.

There are several localities where we expect to erect freezers this year, two on the Magdalen Islands, one at Carleton, Que., and one at Shippegan Island. The following is a list of the different localities, by provinces, where freezers have been erected, with the year they were built and number of bonuses paid to each.

BAIT FREEZERS.

PROVINCE OF NOVA SCOTIA.

Name.	Year built.	Cost of construction		Dept. share.		No. of bonus paid.	Amount.	
		\$	cts.	\$	cts.		\$	cts.
Ballantyne's cove.....	1900	1,361	04	861	04	4		292 00
Port Hood island	1900	1,313	60	656	80	3		220 10
Bayfield.....	1901	1,905	89	952	94	5		470 00
Gabarus.....	1901	1,982	82	991	41	2		151 50
Whitehead.....	1901	963	41	481	70	3		228 45
Port Bickerton.....	1901	1,043	08	521	54	4		256 50
Sambro.....	1901	2,246	66	1,000	00	3		300 00
Port La Tour.....	1901	1,380	03	690	01	0	Sold	
Clark's harbour.....	1901	1,202	88	601	44	3		206 00
Lower East Pubnico.....	1901	2,061	39	1,000	00	1		48 00
Sandy cove.....	1902	1,427	34	713	67	3		292 00
Ingonish.....	1902	1,604	33	797	16	2		114 05
Cheticamp.....	1902	1,277	42	638	71	1		100 00
Eastern harbour.....	1902	1,491	02	745	51	3		294 05
Petit du Grat.....	1902	1,515	95	757	97	4		390 25
Westport.....	1903	1,600	00	800	00	2		151 50
North Sydney.....	1903	2,038	89	1,000	00	2		194 00
Ketch harbour.....	1903	1,401	89	700	94	2		200 00
La Have.....	1904	2,260	81	1,000	00	1		52 00
St. Peters.....	1904	2,036	05	1,000	00	1		53 05
Half Island cove.....	1904	1,816	87	908	43	2		200 00
Lockeport.....	1905	1,788	66	894	33	1		57 10
Louisburg.....	1905	2,290	16	1,000	00	1		80 85
Drum Head.....	1905	1,649	37	824	68	1		100 00
Quoddy.....	1905	857	73	428	86	0		
Big Island.....	1905	1,013	32	506	66	0		
Arisaig.....	1905	1,064	16	532	08	0		
Digby.....	1906	4,441	38	2,000	00	0		
Lunenburg.....	1906	4,544	76	2,000	00	0		

PROVINCE OF NEW BRUNSWICK.

Shediac	1902	1,210	18	605	09	3		300 00
Caraquet.....	1906	1,816	12	908	06	0		.....

PROVINCE OF PRINCE EDWARD ISLAND.

Frog Pond.....	1900	1,160	18	590	09	5		345 35
Alberton.....	1900	1,347	67	673	83	5		450 00
Souris.....	1901	2,064	39	1,000	00	1		10 00
Miminegash.....	1902	840	46	420	23	4		400 00
Rustico.....	1903	1,235	00	617	50	2		200 00

PROVINCE OF QUEBEC.

Bonaventure River.....	1903	1,416	05	916	02	3		300 00
Caplin.....	1904	879	38	439	69	1		97 00
Anse à la Barbe.....	1905	961	12	480	56	1		100 00
Paspebiac.....	1905	1,690	83	845	41	0		.....
Etang du Nord.....	1905	1,729	80	864	90	0		.....
Cabin Cove.....	1906	1,801	13	901	56	0		.....
Maria Capes.....	1906	1,630	46	815	23	0		.....
St. Godfroy.....	1906	1,747	01	873	50	0		.....
Gascons.....	1906	1,695	42	847	71	0		.....
Bonaventure East.....	1906	1,002	81	501	40	0		.....

SESSIONAL PAPER No. 22

The following reports from different freezing stations will give you a better idea than I could possibly give you, from which you can draw your own conclusions.

PRINCE EDWARD ISLAND.

Frog Pond, P.E.I.—The secretary says;—‘I beg leave to report as follows as to the fishing industry and working of the bait freezer in our cove for this year. We put in sufficient ice during the winter, along the first part of May we put in and froze some five tons of herring. Codfish struck in the latter part of May. Fish were plentiful and of large size, plenty live bait. Very little of the frozen bait was used during the season. Codfish and hake continued plentiful and fishermen did well until the latter part of July. Dogfish struck in on July 9th and were quite troublesome. I may say that fish were not quite so plentiful with us this year as they were during the season of 1905, still our fishermen did first-rate while they could keep the gear out.’

Alberton, P.E.I.—The secretary reports as follows:—‘I may say that the season as a whole has been a little better than last season. In the spring lobsters were a good catch, with plenty of herring for bait. June was a rough month and not much was done. Mackerel and cod were fairly plentiful until the first of this month, when the dogfish arrived and since then very little has been done. Our freezer was not in operation this season.

Rustico, P.E.I.—The secretary reports as follows:—‘In looking over the season up to the present time with regard to our freezer, this has been so far the most satisfactory season we have had since our freezer was built. In April and May we froze our herring which has proved to be of very great value to the fishermen. During the summer we froze quite a lot of mackerel which turned out fine. Not only has the frozen bait proved good for cod, haddock and hake, but the most satisfactory results have been obtained in using it for mackerel bait. The boats not using frozen bait to feed the mackerel with found it nearly as well to stay at home as to go out without it. Even the dissatisfied parties have frankly admitted that the freezer has proved a great benefit as well as a blessing to the fishermen here. Very little would have been done here during the past four weeks but for the freezer. We have had very rough weather of late, it seems to me if we have one week of good weather it will finish our bait as there is such a demand for it. There is no kind of fishing that pays like mackerel fishing, that is providing we can get the fish, the prices are usually good and the fish is shipped to the Boston market. I cannot give you an account of the number of barrels of mackerel landed at present. Thanking you for your kindness and interest in our behalf during the past and also to acknowledge our indebtedness to the government in helping us build and run the freezer.’

Souris, P. E. I.—The secretary reports as follows:—‘Replying to yours of the 13th inst., I may say that in our locality the cod fishing was good. Hake was fair up to the present time. Dogfish have appeared on our coast, consequently the past two weeks we were not catching any fish. Mackerel have been very scarce. Herring fishing the past spring was a total failure, impossible to procure a supply for bait freezer. The few barrels we put up came out in excellent condition.’

Mminegash, P.E.I.—The secretary reports as follows:—‘On opening of spring we had difficulty in procuring salt and were only able to put 26 brls. of herring in the freezer, but mackerel struck in well in nets and in hooks during the early part of July and August and we froze over twenty ton of them both for bait and export. All the bait frozen by us was used up by the fishermen this season for bait as well as a considerable quantity of mackerel.’

NOVA SCOTIA.

Arisaig, N. S.—The secretary reports as follows:—‘The lobster catch was below the average, aggregating to about \$2,200 paid to the fishermen. There was but one boat fishing salmon, and the catch was about \$300. The codfish and hake industry together with the lobster fishing constitute the principal source of revenue, the latter amounted to about \$2,500. There was a considerable amount of mackerel and

6-7 EDWARD VII., A. 1907

herring caught, which were used principally for bait, both for lobster and trawling which cannot well be figured as sources of revenue. I might perhaps give a summary of fish caught as follows:—

Lobsters.....	128,000 lb.
Salmon	4,000 “
Codfish and hake.....	520 qtls.

I may say, in conclusion, that although the lobsters were below the average there were considerably more codfish and hake landed on account of having always a good supply of frozen bait from the freezer, notwithstanding the fact that the fish appeared much scarcer on the fishing grounds than in former years.’

Ballantyne's Cove, N.S.—‘As requested, I give below an approximate summary of the quantity of fish landed in the vicinity of Cape George which includes that portion of it which is influenced by the cold storage facilities at Ballantyne's cove. This would embrace Ballantyne's cove, south side Cape George and around the point of the cape to Livingstone's cove.

	Year 1905.	Year 1906.
Total quantity of green cod in lbs.....	56,500	133,266
“ “ “ hake “	65,700	131,544
“ “ herring in brls.....	170	100

From this statement it will be seen that the amount of cod and hake for this year more than doubled that of last year, nor does this include the amount, quite considerable, that was taken in that vicinity by foreign boats. There was a falling off in the amount of herring taken, and as this, with some insignificant catches of mackerel is the staple bait, it will be clearly evident that the cold storage of bait ought to be maintained and utilized. There is no doubt whatever but that the bait stored in the freezer at Ballantyne's cove was a very important factor in the realization of an increased catch of fish this year. This is very evident when we compare the fish industry of Cape George with bait freezer, with that of the neighbouring districts of Lakevale and Morristown without this convenience, for at these latter places, outside of lobsters and salmon very little of any other fish was caught. Indeed it may be safely said that the presence of a freezer in a district greatly influences the catch of lobsters also for it is the means by which lobster fishermen are provided with sufficient fresh bait. Hence we find that while the lobster factory at Morristown was considerably below its average packing, that of Ballantyne's cove was considerably better, some 125 more cases being packed than last year. I have not at hand the comparative figures for salmon, but I believe the quantity caught this year is in advance of last years.’

Port Hood Island, N.S.—The secretary reports as follows:—‘The past season was not a prosperous one. In May we had a few spring herring but not as many as usual. We put up quite a few in the freezer and used them later on. Codfish were very scarce. In August the dogfish struck in and spoiled the fishing altogether. There were a few herring the first part of September, about 200 brls. were taken. The dogfish put a stop to all kinds of fishing. We do not expect any more fishing until December.’

Cheticamp Chapel, N.S.—The secretary reports as follows:—‘The month of May was calm, very few herring were caught. June was stormy, the lobster traps were destroyed and fish were scarce. July was stormy. No fish except dogfish. August and September were also stormy. No bait but plenty of dogfish. There may have been a few mackerel but owing to the storms nothing was done.’

North Bay, Ingonish.—The secretary reports as follows:—‘We have been obliged to meet discouragements during the past year, but in spite of them we have demonstrated the right of the bait freezer to exist and its helpfulness to deep sea fishermen. We filled the freezer to its utmost capacity with sea water ice, packing away 250 tons

SESSIONAL PAPER No. 22

at least. Despite the unusual heat of the summer we have no reason to feel that there has been greater waste from melting than could have been fairly predicted granting the conditions. We have demonstrated again that sea water ice is fit for the purpose of the freezer. At the time of the coming of the herring, May 20, 1906, we had not a single crate of frozen herring left in the freezer. We had thus carried our fishermen through the autumn and winter of 1905, and the spring fishing of 1906 helping them out whenever there was no fresh bait obtainable. The herring came in small numbers and remained but a short time and after their departure did not return again. Here was a great disappointment for we had hoped we might fill up the freezer with fresh herring for the June fishing.

	Lb.
We froze herring (May 20th to 11th).....	4,500
In June we froze mackerel.....	15,284
In June we froze salmon.....	250
Total.....	20,034

We expect at least ten to twelve tons of herring besides mackerel. We think it fair to put the decrease in fish this year and the consequent decrease of earnings at one-third as against last year. We are hopeful for the future and when we get a fair chance believe we can demonstrate a moderate financial success, as well as a real advantage to the fishermen. That time has not yet come. We have demonstrated again that sea water ice is good for our purposes. That fresh fish, frozen fresh, with care and attention makes first-rate bait. That our freezing plant works admirably. That we have helped out a bad year and did our fair share towards preventing hard times this winter.,

North Sydney, N.S.—The secretary reports as follows :—‘ I might say that fishing for the past season has been almost a complete failure. For some reason the herring, which we could always depend upon, failed to put in an appearance last spring, hence there was no bait to start with. The squid struck in fairly plentiful for a few days in August, and we put out our trap and did fairly well for a day or two until the dogfish struck in and if we had not taken it up at once they would have devoured it. Whenever a squid would mesh in trap, the dogfish would eat a hole around it. Now the squid have practically disappeared and I suppose the dogfish have driven them off shore or have made them so wild that they won't jig. The pollock are becoming almost as great a scourge on the bait as dogfish. They arrive about June 1 in immense shoals and drive the herring off in deep water and also drive the mackerel out of traps. They will not take bait and will seldom trap. I think if the government would permit the use of purse seines of 5-inch mesh that it would be profitable to purse seine dogfish and pollock and such a seine would not destroy any other fish.’

St. P. ters, N.S.—The secretary reports as follows :—‘ Fishing has been very good in this bay this season, principally mackerel and herring. The dogfish were very troublesome in August. Very few nets could be set. We froze a great many mackerel and salmon, and found the freezer very useful as we were able to buy all the fresh fish offered from the fishermen, and what we could not get ready for market that day, the freezer held in good condition till the next day. We have plenty ice on hand to freeze squid for fall fishing as soon as it strikes in. There are several going into the fish business this fall from this bay.’

Half Island Cove, N.S.—The secretary reports as follows :—‘ Fish were fair the first part of the season, but of late not much was done on account of bait being scarce, and no frozen bait. Have not been bothered with any dogfish. Some striking in now for the first.’

Canso Cold Storage Co., Canso, N.S.—The secretary reports as follows :—‘ This has been one of the dulllest seasons ever experienced in the fish trade of Canso. The catch

6-7 EDWARD VII., A. 1907

of fish of all kinds has been about the smallest known and there has been a consequent depression in all lines of business. Bait has been unusually scarce. The catch of herring having been small and squid having been almost a total failure up to this time.

We do not think that the depression is anything but a temporary one and no doubt another season may show a very marked difference. It may be that the late fall and early winter will show much better results.

Whitehead, N.S.—The secretary reports as follows :—‘The freezer has not been in operation this summer. Bait was fairly plentiful, but dogfish very troublesome July and part of August. Codfish have been very scarce most of the season, the catch considerably short of last year. There was a very good catch of herring, the best for a number of years, and are yet plentiful, but the dogfish are now appearing and people have had to take in their nets. A fair catch of spring mackerel.’

New Harbour, N.S.—The secretary reports as follows :—‘The catch of cod, pollock and hake was fair. The herring catch has been good and is greater than that of last year. They are still on the grounds.’

Drum Head, N.S.—The secretary reports as follows :—‘It is quite hard to make out an annual report, as I expect the best of the season is yet to come; however, I may say the fishermen here did exceedingly well, landed large quantities of fish. I am sure we come up to last year, and probably better. Fishermen here have used some frozen bait. We have our freezer in good condition. Frozen herring bait on hand now. Fresh bait more plentiful than last year. I am glad to say the people highly appreciate the grand opportunity they have of preserving bait. We cannot speak too highly of this privilege. It is the means of building up the place.

Port Bickerton, N.S.—The secretary reports as follows :—‘It is hard to give a report of the catch of fish for the season as there are nearly two months yet to finish, but the following is as near as I can give at the present time :—

Herring.....	250 brls.
Mackerel.....	20 "
Codfish.....	150 quintals.

In reference to a report of the freezer it was not used. Herring were quite plentiful, but no mackerel and few cod. Dogfish were bothersome.

Quoddy, N.S.—The secretary reports as follows :—‘Reviewing the past season with regard to our freezer, I have to say this will be the most unsatisfactory one since built, owing to the scarcity of ice and bait. Codfish have been scarce all season to date. Some good catches of mackerel were taken. A good run of herring struck in here in August, the first run since 1899, and fishermen made good hauls. Our freezer did not freeze anything this year but expect to operate it another year and give the fishermen the benefit of the products. Our ice house is to be enlarged this fall and we expect to be able to handle a large quantity of frozen bait next season.

Halifax Cold Storage Co.—The secretary reports as follows :—‘On the 30th day of April last we forwarded the Department at Ottawa, data complete at that time, and we have no sales since to report. The stock of frozen herring on hand is 50 tons greater than when data was furnished; the additional fifty tons having been frozen within the past month. We are continuing to freeze and expect by the time the season for using frozen bait is here, that we will have enough to supply the demand. Since furnishing data, we have not had any applications for frozen bait, there being obtainable a sufficient supply of fresh herring. The season for frozen herring bait opens about the first of November or before if fresh bait supply falls off’.

Sambro, N.S.—The secretary reports as follows :—‘The association did not do any business with the freezer last year. They did not put in any ice, nor freeze any bait. Mr. E. M. Bouthillier, of Halifax, froze about three ton of herring and stored about five tons that were already frozen, this was all the use to which the freezer was put’;

SESSIONAL PAPER No. 22

Lockeport, N.S.—The secretary reports as follows :—‘The fishing here has been much better than last year. 20,000 quintals of cod, pollock and haddock, 1,000 brls. of mackerel and 3,000 brls. of herring. The herring have been plentiful till now, when they disappeared.’

La Have N.S.—The secretary reports as follows :—‘*Re* the fishing industry for the present season to date, I may say that it has been a banner year so far as net fishing is concerned and normal for cod, hake and haddock. Fishing operations began in April, frozen bait being procured from our freezer, a little later fresh bait was easy to get. The catch of cod hake and haddock does not equal that of last year, but it is hardly fair to compare the two as most of the fishermen took to net fishing and dropped line fishing in July. The catch of mackerel and herring is certainly an unheard-of occurrence in this locality, mackerel especially. *Re* freezer, the same was filled with 90,000 frozen herring in February and cleaned out in April. We were only able to secure about 100 tons ice, hence could not keep bait any great length of time’.

Lunenburg, N.S.—The secretary reports as follows :—‘The fishing for the season of 1906 has not been a success: the Bank catch especially being below the average, and less than last year, but as some of the vessels are still on the Banks, it is hard to estimate correctly what the shortage will be. The shore catch is also low. This is to a large extent due to the dogfish which were on our shores in large numbers until about August 1st and interfered seriously with the shore fishing. Since the removal of the frozen herring which were principally used to supply the Bank fishermen with bait, our freezer has not been operated until this week, when we started to freeze and place in cold storage some herring now being caught on our shore.’

Clarke's Harbour, N.S.—The secretary reports as follows :—‘I will give you as near as possible a report of the fisheries to date: 1,950,000 lb. mixed fish, 50,000 lb. halibut, 2,000 brls. herring, 2,500 brls. mackerel.

Gabarus, N.S.—The secretary reports as follows :—‘Codfishing at Gabarus has been good this season. Mackerel was also good, but herring not very plentiful. The lobster fishery of our district, indeed of the whole of Cape Breton, was very poor, owing to the unfavourable weather. Only twenty-nine days fishing during the entire season, and as a result of the bad weather the catch is 40 per cent short of the usual quantity. Dogfish not so troublesome as in 1905. About twenty-six tons of herring were put in the cold storage in May and used by the lobster fishermen for bait.’

Bayfield, N.S.—The secretary reports as follows :—‘Owing to the scarcity of herring this spring we did not freeze any bait, but we found the freezer a great benefit in handling our salmon and mackerel. We shipped more salmon this year than ever before. Had a good run of mackerel for a short time, but they did not last long. Cod and hake were scarce owing to the scarcity of bait, but taking the season as a whole our fishing operations were fairly satisfactory.

Eastern Harbour, N.S.—The secretary reports as follow :—‘Herring struck upon the shore in great abundance about the 20th of April, and although the strike was of short duration, the netters were able to secure from 150 to 400 a day. A goodly portion of this herring was stored in the refrigerator to be used again as bait for lobsters. I may also mention that the greater part of the Magdalen Island herring which was secured in the early spring by two small schooners from this port, also found its way to the freezer to be used for bait purposes. This frozen herring came in very handy to the fishermen and was to them at all times available and in good condition.’

QUEBEC.

Beauport River, Que.—The secretary reports as follows :—‘We have ice enough to keep the freezer in operation all fall, and we expect to catch herring this fall to freeze for bait. We could not catch the first herring last spring on account of the ice in this cove, and when the herring came the second time, it was to spawn, conse-

quently no good for bait, so our fishermen say, and that is the reason we did not put many herring in the freezer last spring, but we intend to put in all we can in the fall.'

Caplin, Que.—The secretary reports as follows:—'The herring struck in here on the 9th of May last all over this bay, and were very plentiful. On the 11th of the same month the government sent the fish-curing expert, Mr. Cowie, to instruct the people in the method of curing herring. We had a large meeting and our fishermen are preparing now to go into the herring industry another year. Our people should be truly thankful to the government for their kind consideration in trying to help them in the fishing industry. Codfish first appeared on the 20th of June, but were not very plentiful until the middle of August. The weather was generally fair for fishing except a couple of days of strong westerly winds. The bait consisted of fresh herring and were quite plentiful most of the time till about the 15th of August. During September, dogfish made their appearance and drove the other fish away. At present only a few boats are trying for fish. We did not get up any ice last winter on account of the mild weather. Had we filled the freezer, we would have had to draw the ice some seven miles. We intend putting in a dam in our small brook and have ice near at hand so that our freezer will render the same satisfaction as it did at first.'

Bonaventure East, Que.—The secretary reports as follows:—'Herring were very plentiful during the month of May. A reasonable catch of caplin for the month of June, in July, August and September no bait except frozen bait. Cod fishing for June and July fair. The catch this year at our place will not exceed over 1,000 quintals of dry fish unless the balance of the season turns out better than we expect. The amount of money made this year will be small. We froze about 15 tons of bait last spring and expect to freeze a good deal more this fall. There were no dogfish up to the present date. No haddock or ling.'

Paspébiac, Que.—The secretary reports as follows:—'During the current season fish of all kinds have been a little more abundant than last year, and the weather has been ideal for curing. The presence of dogfish for the past month have retarded operations. This pest has now disappeared. Freezer has been operated, but bait was not used when the fresh article could be obtained.'

Gascons, Que.—The secretary reports as follows:—The last week of May and in the months of June and July the cod fishing has been very good here, and bait was abundant, but we were troubled with dogfish. In the month of August there were no fish owing to the want of bait, but there were plenty of dogfish. Since the first of September there were very few fish but the bait continues scarce. Dogfish still plentiful. In quantity the fish caught have been about three times more than last year for the fish. There have been hardly any lobsters. Salmon have been one-third more than last year. There are no other kinds of fish here. We have tried our new freezer and have frozen over twenty-three tons. Of this quantity sixteen tons have been used, and the fishermen found this bait very good.'

Newport Point, Que.—The secretary reports as follows:—'In compliance with your request, I beg to say that our freezer is nearing completion and will be ready to receive bait in the spring. The high price of lumber this season with several local inconveniences will considerably increase its cost. We are well satisfied with the work. Frozen bait would have been of very little use this season as herring for bait have always been obtainable all through the season, at least up to the present. Bait has been more plentiful this season than it has been for the past ten years.'

Cabin Cove, Magdalen Islands.—The secretary reports as follows:—'Herring were very plentiful in the month of May, but the weather was very bad. The codfishing was fairly well in the latter part of May and June, but the month of July and that of August the weather was fine, but the codfish were scarce and dogfish were very plentiful. The fishermen did fairly well with mackerel fishing in the months of July and August. There are some codfish now, but the weather is very rough. Our bait freezer was filled with herring in the spring in the month of May and we have about

SESSIONAL PAPER No. 22

one half yet on account of plenty bait in May and June. The bait is in good condition and fishermen find it very good.

Etang du Nord, Magdalen Islands.—The secretary reports as follows :—‘ Our association was organized on September 21, 1905, and our building, a thirty-ton freezer, was completed December 15. We filled the ice house with ice in January, 1906, and in May of this year we froze thirty-two thousand pounds of herring for codfish bait. Codfish being very scarce, we have only used about one-third of our bait, but we expect to use the most of it for fall fishing when other bait is scarce. The frozen bait works well and the herring that were put in fresh comes out now just as fresh and firm as when put in. Unfortunately a few of the shareholders took a few soft herrings out of nets to the freezer and it did not freeze as good as the herring we had taken from the seines.’

NEW BRUNSWICK.

Shediac, N.B.—The secretary reports as follows :—‘ During the spring we had considerable quantity of spring herring secured and placed in our freezer, but owing to the great demand for pickled herring and the good prices obtainable, we decided it would be better and to our advantage to dispose of the fish, so had the same pickled in barrels (90 brls. in all) and sold them for a good figure. Since then we have made no use of the freezer, however, as usual we expect it to come in good play next month and the following three months in the smelt business. I may say it is our intention to do something next spring and summer in the general fish business and hope to have a steamer running up the north shore of the province as well as to the island (P. E. I.) procuring fish for the freezer.’

As a brief summary of the season's operations I would beg leave to say that west of Halifax the fisheries have been fairly good, in some sections better than usual. East of Halifax the season generally has been a poor one. The bait freezers have proved to the fishermen beyond a doubt that they are a real necessity and when properly run and managed, they have helped to increase the hardy fishermen's income considerably.

The whole most respectfully submitted.

I have the honour to be, sir,

Your obedient servant,

PETER MACFARLANE

APPENDIX No. 13.

EXPENDITURE AND REVENUE

The total expenditure for all Fisheries services, except Civil Government, for the fiscal year ending June 30, 1906, including Fishing Bounty, amounted to \$968,626 being within the appropriation by \$23,182.

The total net fisheries revenue, during the same period, from rents, license fees, fines and sales, including the *modus vivendi* licenses to United States vessels, amounted to \$98,009.

Service.	Expenditure.		Vote.	
	\$	cts.	\$	cts.
Fisheries.....	155,929	59	155,300	00
Fish-breeding.....	209,279	78	209,500	00
Fisheries protection service.....	249,876	37	250,000	00
Fishing bounty.....	158,546	65	160,000	00
Miscellaneous expenditure.....	194,993	61	217,008	50
Total.....	968,626	00	991,808	50

The details of the above will be found in the Auditor General's report under the proper headings.

In addition to the above, the following summary shows the salaries and disbursements of fishery officers in the several provinces, together with the expenses for maintenance of the different fish-breeding establishments throughout the Dominion.

Service.	Expenditure.	
	\$	cts.
Fisheries, Ontario.....	4,949	67
" Quebec.....	8,123	04
" New Brunswick.....	35,856	38
" Nova Scotia.....	49,351	10
" Prince Edward Island.....	9,351	81
" Manitoba.....	3,687	07
" North-west Territories.....	11,124	22
" British Columbia.....	30,141	33
" Yukon.....	1,083	31
General account.....	2,261	66
Total.....	155,929	59

SESSIONAL PAPER No. 22

FISHERIES GENERAL EXPENDITURE.

The expenditure by provinces is subdivided as follows:—

	Amount.	Total.
<i>Ontario.</i>		
Salaries of officers.....	\$ cts. 3,600 00	\$ cts.
Disbursements of officers.....	1,349 67	
Total.....		4,949 67
<i>Quebec.</i>		
Salaries of officers.....	3,975 00	
Disbursements of officers.....	3,953 04	
Miscellaneous.....	195 00	
Total.....		8,123 04
<i>New Brunswick.</i>		
Salaries of officers.....	6,468 85	
Disbursements of officers.....	9,341 62	
Miscellaneous.....	20,045 91	
Total.....		35,856 38
<i>Nova Scotia.</i>		
Salaries of officers.....	10,452 98	
Disbursements of officers.....	19,081 27	
Miscellaneous.....	19,816 85	
Total.....		49,351 10
<i>Prince Edward Island.</i>		
Salaries of officers.....	3,462 79	
Disbursements of officers.....	2,623 45	
Miscellaneous.....	3,265 57	
Total.....		9,351 81
<i>Manitoba.</i>		
Salaries of officers.....	1,525 00	
Disbursements of officers.....	575 91	
Miscellaneous.....	1,586 16	
Total.....		3,687 07
<i>Northwest Territories.</i>		
Salaries of officers.....	3,280 77	
Disbursements of officers.....	3,356 50	
Miscellaneous.....	4,486 95	
Total.....		11,124 22
<i>British Columbia.</i>		
Salaries of officers.....	6,139 51	
Disbursements of officers.....	4,290 27	
Miscellaneous.....	19,711 55	
Total.....		30,141 33
<i>Yukon.</i>		
Salaries of officers.....		1,083 31
General account.....		2,261 66
Grand total.....		155,929 59

6-7 EDWARD VII., A. 1907

FISHERIES GENERAL EXPENDITURE—*Continued.*

FISH-BREEDING.

Service.	Expenditure,	Total.
	\$ cts.	\$ cts.
Fish-breeding, Ottawa hatchery, Ont.	3,348 39	
" Newcastle " "	4,327 94	
" Sandwich " "	6,463 29	
" Quinté Bass Pond hatchery	772 02	14,911 64
" Tadousac hatchery, Que	4,558 09	
" Gaspé " "	2,183 49	
" Magog " "	2,277 06	
" St. Alexis " "	1,373 57	
" Lac Tremblant "	763 00	
" Lake Lester	1,461 80	
" Chelsea	187 53	12,774 54
" Restigouche " N. B.	5,189 24	
" Miramichi " "	2,551 71	
" St. John River hatchery "	1,226 11	
" Shemogue " "	4,245 69	
" Shippegan " "	4,076 07	
" Carleton " "	8,471 27	25,759 09
" Bedford hatchery, N.S.	1,965 34	
" Margaree " "	2,994 87	
" Bay view " "	3,993 10	
" Canso " "	9,853 77	
" Windsor " "	5,531 75	
" Fourchu " "	8,864 44	33,203 27
" Selkirk " Man	3,326 33	
" Berens R " "	22,596 96	25,923 29
" Fraser River hatchery, B.C.	10,927 70	
" Granite Creek " "	8,509 45	
" Skeena " "	6,453 58	
" Pemberton " "	22,096 12	
" Harrison Lake " "	14,126 61	
" Rivers Inlet " "	21,573 70	83,687 16
" Kelly's Pond, P.E., Id.	2,950 13	
" Charlottetown	3,468 91	6,419 04
General account		6,601 75
		209,279 78

SESSIONAL PAPER No. 22

FISHERIES GENERAL EXPENDITURE—*Continued.*FISH-BREEDING—*Continued.*

SALARIES, ETC.	\$ cts.	\$ cts.
General account	6,601 75	6,601 75
<i>Newcastle Hatchery.</i>		
Salaries.....	1,440 00	
Miscellaneous expenditure.....	2,887 94	
Total.....		4,327 94
<i>Sandwich Hatchery.</i>		
Salaries.....	1,050 00	
Miscellaneous expenditure.....	5,413 29	
Total.....		6,463 29
<i>Ottawa Hatchery.</i>		
Salaries.....	1,625 83	
Miscellaneous expenditure.....	1,722 56	
Total..		3,348 39
<i>Quinté Bass Pond.</i>		
Salaries	143 75	
Miscellaneous expenditure.....	628 27	
Total.....		772 02
<i>Tadousac Hatchery.</i>		
Salaries.....	800 00	
Miscellaneous expenditure	3,758 09	
Total		4,558 09
<i>Gaspé Hatchery.</i>		
Salaries.....	600 00	
Miscellaneous expenditure.....	1,583 49	
Total.....		2,183 49
<i>Magog Hatchery.</i>		
Salaries.....	690 00	
Miscellaneous expenditure.....	1,887 06	
Total		2,277 06
<i>St. Alexis Hatchery.</i>		
Salaries.....	360 00	
Miscellaneous expenditure.....	1,013 57	
Total.....		1,373 57
<i>Restigouche Hatchery.</i>		
Salaries.....	1,100 00	
Miscellaneous expenditure.....	4,089 24	
Total.....		5,189 24
Carried forward.....		37,094 84

6-7 EDWARD VII., A. 1907

FISHERIES GENERAL EXPENDITURE—*Continued.*FISH-BREEDING—*Continued.*

	\$	cts.	\$	cts.
Brought forward.....			37,094	84
<i>Miramichi Hatchery.</i>				
Salaries.....	1,000	00		
Miscellaneous expenditure.....	1,551	71		
Total.....			2,551	71
<i>St. John River Hatchery.</i>				
Salaries.....	900	00		
Miscellaneous expenditure.....	325	11		
Total.....			1,225	11
<i>Shippegan Hatchery.</i>				
Salaries.....	276	00		
Miscellaneous expenditure.....	3,800	07		
Total.....			4,076	07
<i>Shemogue Hatchery.</i>				
Salaries.....	283	00		
Miscellaneous expenditure.....	3,962	69		
Total.....			4,245	69
<i>Bay View Hatchery.</i>				
Salaries.....	234	00		
Miscellaneous expenditure.....	3,759	10		
Total.....			3,993	10
<i>Bedford Hatchery.</i>				
Salaries.....	1,400	00		
Miscellaneous expenditure.....	565	34		
Total.....			1,965	34
<i>Margaree Hatchery.</i>				
Salaries.....	500	00		
Miscellaneous expenditure.....	2,494	87		
Total.....			2,994	87
<i>Selkirk Hatchery.</i>				
Salaries.....	1,500	00		
Miscellaneous expenditure.....	1,826	33		
Total.....			3,326	33
<i>Fraser River Hatchery.</i>				
Salaries.....	1,250	00		
Miscellaneous expenditure.....	9,677	70		
Total.....			10,927	7
<i>Pemberton Hatchery.</i>				
Miscellaneous expenditure.....	22,096	12	22,096	12
Carried forward.....			94,496	88

SESSIONAL PAPER No. 22

FISHERIES GENERAL EXPENDITURE—*Continued.*FISH-BREEDING—*Concluded.*

	\$	cts.	\$	cts.
Brought forward			94,496	88
<i>Rivers Inlet Hatchery.</i>				
Salaries.....	1,000	00		
Miscellaneous expenditure.....	20,573	70	21,573	70
<i>Lake Lester Hatchery.</i>				
Salaries.....	600	00		
Miscellaneous expenditure	861	80		
Total.....			1,461	80
<i>Granite Creek Hatchery.</i>				
Salaries.....				
Miscellaneous expenditure.....	8,509	45	8,509	45
Total				
<i>Lac Tremblant Hatchery.</i>				
Salaries	169	48		
Miscellaneous expenditure.....	593	52	763	00
<i>Charlottetown Hatchery.</i>				
Miscellaneous expenditure.....	3,468	91	3,468	91
<i>Canso Hatchery.</i>				
Salaries.....	117	00		
Miscellaneous expenditure.....	9,736	77	9,853	77
<i>Harrison Lake Hatchery.</i>				
Salaries.....	1,200	00		
Miscellaneous expenditure.....	12,926	61	14,126	61
<i>Windsor.</i>				
Salaries.....	350	00		
Miscellaneous expenditure.....	5,181	75	5,531	75
<i>Chelsea Pond.</i>				
Miscellaneous expenditure.....	157	53	157	53
<i>Fourchu Pond.</i>				
Miscellaneous expenditure.....	8,864	44	8,864	44
<i>Berens River Hatchery.</i>				
Miscellaneous expenditure.....	22,596	96	22,596	96
<i>Carleton Pond.</i>				
Miscellaneous expenditure.....			8,471	27
Total.....				

6-7 EDWARD VII., A. 1907

FISHERIES GENERAL EXPENDITURE.

FISHERIES PROTECTION SERVICE—1905-1906.

	\$	cts.	\$	cts.
General Account.....			9,841	31
<i>Steamer 'La Canadienne.'</i>				
Wages of officers and men.....	7,682	49		
Provisions.....	3,397	92		
Fuel.....	3,008	75		
Repairs and supplies.....	4,580	20		
Miscellaneous expenditure.....	3,531	32		
Total.....			22,200	68
<i>Steamer 'Princess.'</i>				
Wages of officers and men.....	3,145	09		
Provisions.....	440	41		
Fuel.....	276	07		
Repairs and supplies.....	712	20		
Miscellaneous expenditure.....	195	04		
Total.....			4,768	81
<i>Steamer 'Curlew.'</i>				
Wages of officers and men.....	7,039	69		
Provisions.....	2,156	90		
Fuel.....	1,292	73		
Repairs and supplies.....	3,183	95		
Miscellaneous expenditure.....	696	02		
Clothing.....	386	75		
Total.....			14,746	04
<i>Steamer 'Petrel.'</i>				
Wages of officers and men.....	9,387	70		
Provisions.....	2,962	52		
Fuel.....	1,311	22		
Repairs and supplies.....	3,677	08		
Miscellaneous expenditure.....	8,386	61		
Clothing.....	639	23		
Total.....			26,364	36
<i>Steamer 'Constance.'</i>				
Wages of officers and men.....	8,517	38		
Provisions.....	3,487	47		
Fuel.....	2,809	42		
Repairs and supplies.....	4,391	26		
Miscellaneous expenditure.....	3,750	15		
Clothing.....	1,024	08		
Total.....			23,979	76
<i>Schooner 'Osprey.'</i>				
Wages of officers and men.....	4,555	39		
Provisions.....	2,051	30		
Fuel.....	13	87		
Repairs and supplies.....	1,359	34		
Miscellaneous expenditure.....	934	15		
Clothing.....	451	80		
Total.....			9,365	85
Carried forward.....			111,266	81

SESSIONAL PAPER No. 22

FISHERIES GENERAL EXPENDITURE—*Continued.*FISHERIES PROTECTION SERVICE—*Continued.*

	\$	cts.	\$	cts.
Brought forward			111,266	81
<i>'Georgia.'</i>				
Wages of officers and men	3,295	81		
Provisions		715 69		
Fuel		925 73		
Repairs and supplies		501 77		
Miscellaneous		485 58		
Total			5,924	58
<i>'Swan.'</i>				
Wages of officers, &c.	1,950	00		
Provisions		122 50		
Fuel		393 00		
Repairs and supplies		616 90		
Miscellaneous		7 00		
Total			3,090	30
<i>'Rocket,' (of Lake Winnipeg.)</i>				
Wages of officers and men	2,878	90		
Provisions		661 59		
Fuel		208 33		
Repairs and supplies		604 59		
Charter	2,500	00		
Miscellaneous		1,014 29		
Total			7,867	70
<i>'Kestrel.'</i>				
Wages, &c.	16,295	42		
Provisions		9,521 41		
Fuel		2,895 00		
Repairs and supplies		2,908 33		
Miscellaneous		1,981 75		
Clothing		1,002 90		
Total			34,604	81
<i>'Falcon.'</i>				
Wages, &c.	3,896	97		
Provisions		1,721 06		
Fuel		1,504 88		
Repairs and supplies		3,167 39		
Miscellaneous		203 80		
Total			10,494	07
<i>'Vigilant.'</i>				
Wages of officers and men	14,181	46		
Provisions		4,176 56		
Fuel		4,780 80		
Repairs and supplies		5,923 54		
Miscellaneous		2,483 85		
Clothing		1,339 30		
Total			32,585	51
Carried forward			205,833	78

6-7 EDWARD VII., A. 1907

FISHERIES GENERAL EXPENDITURE—*Concluded*FISHERIES PROTECTION SERVICE—*Concluded.*

	\$ cts.	\$ cts.
Brought forward		205,833 78
<i>'Canada.'</i>		
Wages	19,861 84	
Provisions	11,553 53	
Fuel	3,702 54	
Repairs and supplies	23,411 91	
Clothing	1,776 86	
Miscellaneous	5,143 86	
		65,450 54
Fisheries Intelligence Bureau		2,575 81
Grand total		273,860 13
Less amount paid by Customs Department for St'r. <i>'Constance'</i>		23,983 76
Net total		249,876 37
	\$ cts.	\$ cts.
MISCELLANEOUS.		
Building fishways	2,926 63	
Legal and incidental expenses	780 47	
Canadian fisheries exhibit	5,351 08	
Expenditure in connection with the distribution of fishing bounties	5,583 62	
Surveys of oyster beds	3,708 14	
Issuing licenses to United States fishing vessels	640 65	
Cold storage	84,678 90	
Georgian Bay biological laboratory	2,110 39	
Fishery Commission	14,998 22	
Disposal of Dogfish	63,114 35	
Fish drier, Souris, P.E.I.	10,509 50	
Fisheries Intelligence reporters	225 00	
Gratuity widow N. Lavoie	166 66	
" parents E. Richard	200 00	
Total		194,993 61

SESSIONAL PAPER No. 22

STATEMENT of Fisheries Revenue paid to the credit of the Receiver General of Canada
for the Fiscal Year ending June 30, 1906.

	Amount.	Refunds.	Net Amount.
	\$ cts.	\$ cts.	\$ cts.
Ontario.....			499 15
Quebec.....	7,576 39	12 09	7,564 39
Nova Scotia.....	4,939 43	5 00	4,934 43
New Brunswick.....	11,399 29	3 45	11,395 84
Prince Edward Island.....			2,206 25
Manitoba.....	4,160 00	12 00	4,148 00
Northwest Territories.....			868 97
British Columbia.....	51,582 50	50 00	51,532 50
Yukon.....			282 00
Hudson Bay.....			10 00
			83,441 53
Licenses to U. S. fishing vessels.....			14,568 16
Total.....			98,009 69

6-7 EDWARD VII., A. 1907

COMPARATIVE STATEMENT of Expenditure and Revenue of the

No.		1890-91.		1891-92.		1892-93.	
		Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.
		\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1	General Account Fisheries...						
2	Ontario	15,540 30	26,517 70	15,155 83	25,368 90	20,116 91	30,623 09
3	Quebec	10,666 98	3,642 14	10,917 36	4,742 76	11,761 34	7,471 70
4	New Brunswick	16,082 77	7,193 69	15,707 98	6,334 83	15,721 05	7,831 53
5	Nova Scotia	17,844 19	5,582 65	18,755 86	3,357 42	19,444 22	6,782 02
6	Prince Edward Island	3,242 25	667 00	1,835 65	166 00	2,847 60	304 10
7	Manitoba and N. W. Terrs. ...	3,609 03	1,234 00	3,593 43	1,079 00	3,932 96	1,661 68
8	British Columbia	4,220 53	12,859 02	6,158 17	8,192 48	5,490 60	40,264 00
9	Fish-breeding and fishways ..	39,496 45	1,286 50	43,957 74	178 00	47,322 49	.....
10	Fisheries Protection Service ..	83,050 16	1,934 49	93,397 40	.....	106,805 39	.....
11	Miscellaneous	13,382 28	.....	17,449 06	.....	100,602 14	.....
	Totals	207,234 94	60,917 19	226,928 48	49,719 39	334,044 70	94,938 12
	Fishing bounties.	165,967 22	.....	156,892 25	.....	159,752 15	.....
		1897-98.		1898-99.		1899-00.	
12	General Account Fisheries...	2,389 66	.....	2,632 12	.....	652 41	.....
13	Ontario	19,239 34	30,574 57	11,784 22	5,830 85	3,804 94	794 12
14	Quebec	11,140 16	7,571 15	11,350 27	6,287 71	5,452 41	2,543 04
15	New Brunswick	17,063 58	5,317 08	22,922 50	10,430 08	21,659 94	12,015 27
16	Nova Scotia	21,683 91	11,511 85	25,348 11	6,668 22	27,461 91	5,494 49
17	Prince Edward Island	6,775 78	2,707 57	6,832 85	2,242 24	7,364 30	2,207 12
18	Manitoba	1,206 26	1,515 00	1,883 37	1,537 85	1,723 59	2,028 00
19	N. W. Territories	2,324 66	393 87	4,065 68	150 50	3,848 25	1,522 50
20	British Columbia	8,508 79	47,864 75	8,459 47	45,801 75	13,662 17	53,195 35
21	Yukon .....	.....	.....	.....	.....	.....	.....
22	Hudson Bay Territory .....	.....	.....	.....	.....	.....	.....
23	Fish-breeding	28,002 32	.....	34,522 57	.....	38,070 12	.....
24	Fisheries Protection Service ..	101,807 96	.....	105,133 27	.....	97,370 11	.....
25	Miscellaneous	59,919 56	.....	23,207 73	.....	31,125 67	.....
	Totals	280,061 98	107,455 84	427,599 16	76,949 20	411,717 35	79,799 89
	Fishing bounties.	157,504 00	.....	159,459 00	.....	160,000 00	.....
		1904-05.		1905-06.			
26	General Account Fisheries...	1,314 75	.....	2,261 66	.....	.....	.....
27	Ontario	4,294 60	1,471 51	4,949 67	499 15	.....	.....
28	Quebec	6,769 16	4,648 86	8,123 04	7,564 39	.....	.....
29	New Brunswick	25,253 16	11,887 19	35,856 38	11,395 84	.....	.....
30	Nova Scotia	32,619 85	6,448 88	49,351 10	4,934 43	.....	.....
31	Prince Edward Island	6,879 05	2,046 50	9,351 81	2,206 25	.....	.....
32	Manitoba	2,800 64	4,875 70	3,687 07	4,148 00	.....	.....
33	N. W. Territories	7,003 55	1,151 50	11,124 22	868 97	.....	.....
34	British Columbia	16,631 37	47,436 00	30,141 33	51,532 50	.....	.....
35	Yukon	1,400 00	340 00	1,083 31	282 00	.....	.....
36	Hudson Bay Territory .....	.....	10 00	.....	10 00	.....	.....
37	Fish-breeding	149,419 24	.....	209,279 78	.....	.....	.....
38	Fisheries Protection Service ..	462,082 12	.....	249,876 37	.....	.....	.....
39	Miscellaneous	105,892 97	10,472 00	194,993 61	14,568 16	.....	.....
	Totals	822,360 46	90,988 14	968,625 00	98,009 69	.....	.....
	Fishing bounties	157,228 24	.....	158,546 65	.....	.....	.....

NOTE—Miscellaneous Revenue consists of U.S. *Modus vivendi* License.

SESSIONAL PAPER No. 22

Fisheries Department from July 1, 1890, to June 30, 1906.

1893-94.		1894-95.		1895-96.		1896-97.		No.
Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	
\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	
						2,198 47		1
22,634 37	28,632 82	21,938 56	33,211 60	24,917 48	35,681 68	21,592 40	32,814 66	2
11,692 82	7,211 82	12,459 34	8,836 18	11,870 43	8,160 98	12,910 80	7,876 12	3
18,522 94	8,333 24	21,370 94	11,170 36	20,526 56	10,696 88	21,671 92	10,110 77	4
20,420 81	5,296 27	23,555 38	7,075 07	23,049 41	6,180 93	23,682 33	5,239 55	5
3,078 55	980 15	3,796 58	3,312 30	3,555 87	2,161 85	3,744 36	2,032 25	6
5,331 29	926 99	6,178 71	2,458 80	6,915 20	2,256 69	1,908 14	1,719 00	7
5,283 21	25,337 90	6,218 74	23,517 25	6,226 77	26,410 75	2,181 58	344 13	8
45,024 67		39,730 93		38,050 41		8,841 64	39,888 82	9
115,147 59		100,207 29		102,021 72		27,330 73		10
34,892 19		24,619 86		20,203 25		99,357 01		11
						62,777 30		
282,028 44	76,719 19	260,076 33	89,581 56	257,237 10	91,549 76	289,197 01	100,025 30	
158,794 54		160,089 42		163,567 99		154,389 77		
1900-01.		1901-02.		1902-03.		1903-04.		
Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	Expendi- ture.	Revenue.	
\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	
1,117 49		765 78		402 97		1,362 11		12
3,819 57	717 35	4,445 93	373 42	4,650 53	1,818 83	4,500 43	2,578 48	13
7,934 03	4,738 92	6,242 58	2,498 85	6,785 86	4,379 15	7,619 67	4,670 64	14
28,452 51	10,150 40	23,813 62	11,658 34	27,132 84	11,188 02	27,664 34	10,593 20	15
35,760 39	6,595 94	32,618 00	6,084 65	39,118 79	3,962 45	30,003 01	3,685 75	16
7,934 03	1,525 30	7,814 02	1,843 45	7,081 60	2,007 35	7,320 96	1,983 42	17
2,669 74	1,103 00	2,624 87	2,279 00	3,129 70	1,784 00	2,789 74	4,002 70	18
6,251 39	1,222 55	5,928 22	950 07	7,076 26	1,350 50	7,317 49	922 50	19
17,886 36	2,960 35	18,560 73	41,178 65	17,808 45	43,015 62	15,133 65	56,904 34	20
		2,066 66	1,130 00	1,522 00	320 00	1,400 00	240 00	21
							10 00	22
68,961 40		79,891 85		77,330 86		109,286 07		23
124,211 21		152,723 69		145,137 49		204,654 66		24
27,833 79	9,178 50	56,131 26	11,223 65	30,903 27	8,925 40	56,828 18	10,165 50	25
332,767 07	88,145 11	393,627 21	79,169 58	368,091 12	78,635 82	475,880 31	95,756 53	
158,802 50		155,942 00		159,853 50		158,943 70		

39TH ANNUAL REPORT OF THE DEPARTMENT OF MARINE AND
FISHERIES, FISHERIES BRANCH

FURTHER CONTRIBUTIONS

TO

CANADIAN BIOLOGY

BEING STUDIES FROM THE

MARINE BIOLOGICAL STATION OF CANADA

1902-1905

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[No. 22a—1907.]

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PREFATORY NOTE.

BY THE DIRECTOR.

Since the issue of the last series of scientific papers from the Marine Biological Station of Canada, (under the title 'Contributions to Canadian Biology, 1901') researches of a varied and important nature have been continued by the staff of scientific investigators who, from season to season, have worked at the station. It is pleasing for me to be able to report that many of the ablest Canadian biologists, as well as University assistants, demonstrators, and students qualified to conduct original researches, have taken advantage of the facilities provided by the Dominion government; and the investigations, begun in 1899 at St. Andrews, New Brunswick, have been continued at Canso, N.S. (1901-1902), Malpeque, P.E.I. (1903-1904), and Gaspé, P.Q. (1905). The stay in each locality has been limited to two years, and biennially the station has been towed upon its scow to a new site, thus permitting of the fisheries in an extensive series of areas coming, in succession, under the purview of the scientific staff. Indeed, during the comparatively short career of the institution up to the present date, all the maritime provinces have been visited, and vital fishery questions in each have been looked into, and important facts ascertained. In each locality where the station has been placed the fish and fisheries characteristic of the district adjacent, have occupied the attention of the staff, but faunistic, botanical, chemical and other studies have been carried on assiduously. A thorough understanding of the conditions essential to the prosperity of any fishing industry is only possible when the various biological and physical features of the coast and the waters concerned have been ascertained. The study of the 'environment' of fish and fisheries is as necessary as the study of the fish themselves and their habits, or of the practical methods of exploiting fishery resources. Hence the completion of exhaustive reports upon fisheries in all their aspects, practical, commercial and scientific, is possibly only after continued work for many years. Hasty publication often implies immature results, and doubtful conclusions and recommendations.

A glance at the table of contents will show that the thirteen reports, now presented as 'Further Contributions,' deal with practical and technical matters bearing upon the fisheries, and the important and complex problems which they involve.

The 'Plankton' investigations of which Professor R. Ramsay Wright furnishes the first instalment, indicate the kind and abundance of food, in the area examined, upon which the schools of young food-fishes subsist. In the absence or scarcity of such food these young fish would perish, and it would, of course, be vain to expect a plenitude of adult fish in future years. The abundance of marketable fish depends upon the abundance of young fry hatched out in the 'nurseries' or breeding areas in the sea, and the young fish can only be plentiful when the minute floating food or 'Plankton' is locally rich, varied, and plenteous. It would be superfluous to dwell upon the great value of such researches as those carried on for some years by Professor A. P. Knight

(Queen's University). The effects of dynamite, illegally used in fishing operations, and the actual and unquestionable results of sawdust pollution in waters frequented by fish, have been investigated with thoroughness and rigid accuracy, for the first time in Canada, under the auspices of the Marine Biological Station. Intense public interest has been aroused by the publication of the preliminary accounts of Professor Knight's prolonged and laborious investigations, and the final reports are included in the present series.

Dr. Joseph Stafford, who for some years has devotedly performed the duties of curator at the station, and year after year, has spent the whole season from the opening to the close, in faunistic, fishery and other studies, especially the study of fish-parasites, contributes further interesting papers, and it is important to note how many of the universities of the Dominion have sent workers to the Marine Biological Station. Toronto and McGill Universities have been prominently represented. Queen's University, Kingston, has almost every season sent some representative of its academic staff, while Dalhousie (Halifax), Mount Allison (Sackville, N.B.), Acadia (Wolfville, N.S.), and other universities, including some United States' institutions have sent workers. The station has been hampered in various ways, by the limited nature of its reference library, but especially by the lack of a suitable fishing launch fitted for investigating deep-sea grounds. These wants are happily being gradually supplied, the library already embraces a valuable and representative series of memoirs and reference works, and with due encouragement the Marine Biological Station of Canada will ere long rank as one of the best and most valuable fishery research institutions on this continent.

EDWARD E. PRINCE,
Dominion Commissioner of Fisheries.

December 30, 1905

CONTENTS

	PAGE.
I.—‘The Plankton of Eastern Nova Scotia Waters,’ an account of certain floating organisms upon which young food-fishes mainly subsist, by Professor R. Ramsay Wright, M.A., LL.D., &c., Professor of Biology, University of Toronto, Assistant Director of the Marine Biological Station of Canada (Plates I-VII.)	1
II.—‘The Effects of Dynamite Explosions upon Fish Life,’ by Professor A. P. Knight, M.A., M.D., &c., Professor of Animal Biology, Queen’s University, Kingston	21
III.—‘On the Fauna of the Atlantic Coast of Canada,’ an introductory report by Dr. Joseph Stafford, Lecturer in Zoology, McGill University, Montreal, Curator of the Marine Biological Station of Canada	31
IV.—‘A Further Report upon the Effects of Sawdust on Fish-Life,’ by Professor A. P. Knight, M.A., M.D., &c., Queen’s University, Kingston (5 figures in text)	37
V.—‘The Diatomaceæ of Canso Harbour, Nova Scotia’—A provisional list, by Dr. A. H. MacKay, Superintendent of Education for the Province of Nova Scotia, Halifax, N.S.	55
VI.—‘Report on the Flora of Canso, Nova Scotia,’ by Professor James Fowler, M.A., LL.D., Professor of Botany, Queen’s University, Kingston	59
VII.—‘The Sea Weeds of Canso,’ being a contribution to the study of eastern Nova Scotia Algæ, by C. B. Robinson, B.A., Pictou Academy, Pictou, N.S.	71
VIII.—‘Report on the Marine Polyzoa of Canso, N.S.’ by George A. Cornish, B.A., University of Toronto	75
IX.—‘Notes on the Fishes of Canso,’ by George A. Cornish, B.A., University of Toronto	81
X.—‘Preliminary Report on the Trematodes of Canadian Marine Fishes,’ by J. Stafford, M.A., Ph.D., Lecturer upon Zoology, McGill University, Montreal	91
XI.—‘The Eggs and Early Life-History of the Herring, Gaspereau, Shad and other Clupeoids,’ by Professor Edward E. Prince, F.R.S.C., &c., Dominion Commissioner of Fisheries and General Inspector of Fisheries for Canada, Director of the Marine Biological Station (Plates VIII-X.)	95
XII.—‘Sawdust and Fish-Life—Final Report,’ by Professor A. P. Knight, Queen’s University, Kingston	111
XIII.—‘Professor Macallum on the Chemistry of Medusæ,’ by Professor E. E. Prince, Ottawa	121

PLATES.

Plates I., II., III., IV., V., VI., VII., illustrating Professor R. Ramsay Wright’s report on ‘The Plankton of Eastern Nova Scotia Waters.’

Plates VIII., IX., X., illustrating Professor E. E. Prince’s report on ‘The Eggs and early Life-History of the Herring, Shad and other Clupeoids.’

FIGURES IN THE TEXT.

Figs. 1 to 5, illustrating Professor A. P. Knight’s report on ‘The Effects of Sawdust on Fish-Life.’

I

THE PLANKTON OF EASTERN NOVA SCOTIA WATERS.

AN ACCOUNT OF FLOATING ORGANISMS UPON WHICH YOUNG FOOD-FISHES MAINLY SUBSIST.

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(WITH SEVEN PLATES.)

INTRODUCTION.

Within recent years much attention has been given to the floating microscopic organisms which abound in all great bodies of water—fresh and salt. It had not been sufficiently realized until it was insisted upon by Haeckel, Hensen, Brandt and others, that our attention has hitherto been arrested chiefly by the animal life of the sea and the great lakes to the neglect of the vegetable food-supply which necessarily forms the *conditio sine qua non* for the existence of all animal life. On land the vegetable kingdom everywhere seems to be predominant, and to account amply for all the animal life which feeds on it directly or indirectly. But in the ocean, the obvious plants—the seaweeds, brown, green and red—form a mere inconspicuous fringe of vegetation along the shore, and do not extend out beyond a few fathoms in depth. Such a fringe of vegetation can practically be neglected as the basic food-supply of the animal life of the ocean, and the question comes to be, ‘Whence do marine animals derive their fundamental supply of nourishment?’ Living creatures are either builders or destroyers of protoplasm, or in familiar parlance, either plants or animals, and the former are necessary to sustain the life of the latter. In what form then do these necessary protoplasm builders exist in the sea and other great bodies of water?

The answer is, in the form of microscopic plants, often quite invisible to the naked eye and yet present in such enormous numbers, not only at the surface but through the whole of the superficial layers of waters, some sixty fathoms deep (as far as the sunlight reaches, on the presence of which their power to build protoplasm depends) that it has been calculated that an acre of sea-water—surface measurement—furnishes as much nutritive vegetable matter as does an acre of rich meadow land in the course of a year.

No one sailing over the Atlantic suspects the presence of such a rich vegetation, and indeed it can only be disclosed by filtering the water through an exceedingly fine fabric—the finest silk gauze used by millers is that generally employed for the purpose—and this is usually done by towing a net of such a fabric behind a boat so as to insure a definite amount of water passing through it.

Investigations made in this way may be either qualitative—merely to determine the nature and relative numbers of the organisms so captured—or quantitative—to determine the absolute amount of the different kinds of organisms in a column of water of given dimensions.

It is such quantitative investigations which have rendered the statements as to the richness of the marine vegetation possible, which are made in the foregoing paragraph.

The tiny organisms obtained in this way are not all plants, many of them are animals, feeding on the former, and themselves serving as food for larger creatures.

Many of our important food-fishes, such as those of the herring and mackerel families, are known as plankton feeders, for their gill-arches are provided with a sifting apparatus which enables them to sift out from the water which they are breathing, the minute organisms it contains, and the young stages of all fish pass through a phase when they are dependent on the same kind of nourishment. Without a glance at the catch of a tow-net it seems incredible that fish of any size should be dependent on such inconspicuous food, but sometimes at the height of the summer a careful inspection of the water itself betrays its richness in life. In our inland lakes, e.g., the 'blossoming' or 'flowering' of the lake in August, when the water is full of minute green points, is a phenomenon which often attracts attention and is only a temporary exaggeration of a permanent condition. The astounding rate at which these minute creatures reproduce themselves, is one of the noteworthy facts about them.

Although there are various methods of reproduction, one of the commonest is that of division into two after they have grown to their typical size. Maupas has calculated that if a little Infusorian, not as big as the head of a pin, continued to reproduce at its ordinary rate of division—five times a day—it would, at the end of a month, form a mass of protoplasm a million times as big as the sun! It is obvious that the rate of consumption of such creatures by larger forms must be very high to keep down the population to the normal relations in which we find them, and of course the rate of reproduction of the minute plants is dependent on the amount of the carbon, nitrogen, and other elements of their food available in the sea water.

But it must be remembered that these minute plants are constantly being devoured by animals, some little bigger than themselves, others much larger, hence no one species ever gets the opportunity of monopolizing the ocean.

Another noteworthy circumstance is that our northern waters appear to be richer in plankton vegetation than those nearer the equator, richer at least, in the mere quantity of vegetable matter, not in beauty or variety of form, for the tropical species are certainly more varied, and in many cases more beautiful than the northern ones. To this wealth in microscopic organisms of our waters we owe the circumstance that we are able to supply warmer climes with the surplus of our fish production. The reason of this greater richness is not apparent; Brandt has suggested that it may be due to a deficiency of nitrogen in warmer waters owing to the more favourable conditions for the growth of denitrifying bacteria.

Before giving a detailed description of the minute life of the ocean, a few remarks as to its general character will be appropriate. The simple plants which constitute the bulk of the marine vegetation are frequently *Peridinia* (Plate I.), single cells of odd shape usually furnished with a decorated shell, and swimming actively by means of two long lash-like 'flagella.' Some of these *Peridinia* it is improper to describe as plants, for they seem to be destitute of chlorophyll and therefore obliged to depend upon preformed living matter for their food.

Another group abundantly represented in the open water is that of the *Diatoms* (Plate II.). These have always a resistant siliceous shell, and do not swim actively like the foregoing. Both of these groups of plants, however, require to live in the stratum of water penetrated by sunlight, and they do this either by their own exertions, but usually owing to the presence of organs which render floating easy, such as long delicate spines or the like, or again, to the presence of fat or oil which diminishes the specific gravity of the cells.

The chlorophyll in the *Peridinia* and *Diatoms* is often masked by other colouring matters usually of a brownish hue, but there are also unicellular plants of a pure green chlorophyll like some of those represented in Plate III., while in addition to these there occur many extremely minute forms of various colours, but in shape approaching that of the *Chrysomonad*, Fig 11, so small as to elude the meshes of the fabric generally employed. The mesh of the latter is usually $\frac{1}{200}$ of an inch on the side, but many little creatures actively swimming by means of lash-like prolongations of their

SESSIONAL PAPER No. 15a

protoplasm, the so-called '*Flagellata*,' do not exceed $\frac{1}{3000}$ of an inch in diameter, and slip through such a mesh with ease, unless accidentally arrested by the threads.

As to the one-celled animals which, of course, feed on these smaller plants, they belong to the various groups represented on Plate IV., and some of them form with *Peridinia* and *Diatoms*, a conspicuous part of the food of oysters and similar molluscs.

Again, the plankton contains many young phases of higher animals which swim about for the earlier part of their life and afterwards settle down to more or less sedentary habits. Such is the case with the sea-urchins, worms, molluscs, &c., some of the young of which are represented on Plate V. These larvæ are, of course, dependent on the minute life of the plankton for their food, and are themselves devoured by larger animals.

But there are also adult animals of small size rarely more than the $\frac{1}{8}$ of an inch or so in length, which are constantly eating up the crop of microscopic plants, and which themselves form the bulk of the food of plankton-feeding fish; such are the *Copepods* represented on Plates VI., and the *Tunicates*, on Plate VII. And, finally, reference should be made to the floating eggs of various fishes like the cod, occurring in enormous numbers, few of which ever reach maturity, but are destined to furnish nourishment to the plankton feeders.

Many of the creatures and eggs referred to are exquisitely adapted to their floating (pelagic) life, by their extreme translucency, which makes them almost invisible in the water. Such is notably the case with forms like those shown in Plate V., Fig. 13, and Plate VII., Figs. 11 to 13.

The following account of the organisms observed at Canso is intended as a preliminary one, one of the results of which it is hoped may be the lightening of the initial labours of future investigators into the Canadian plankton, and another, that some workers may thereby be induced to enter this interesting field of research, which requires, owing to the vast extent of our Dominion waters, to be sub-divided to give entirely satisfactory conclusions.

PERIDINIALES.

PROROCENTRIDÆ.

This family embraces the simplest forms of Dinoflagellata, and one of the genera at least suggests by the symmetry of its bivalve shell a relationship to the Diatoms, the colouring of which they also share. The characteristic girdling furrow of the more typical members of the order is absent.

EXUVIAELLA.—Cienkowski.

This differs from *Prorocentrum* in the lack of the prominent anterior spine of that genus. The specimens observed at Canso, and more frequently at Malpeque, P.E.I., belong to the species *E. marina* (Plate I., fig. 1), but there appears to be a slight difference in that the posterior half of the shell is decorated with some short projecting spines which may entitle it to the varietal name '*hispidula*.' The dimensions are $42 \times 33\mu$.

PROROCENTRUM.—Ehrb.

P. micans E. (Plate I., fig. 2) also more abundant at Malpeque, appears to be identical with the common European form; it is longer and slenderer than *Exuviaella* and less symmetrical in outline. The two foregoing species, especially the latter, are important constituents of the oyster's food.

GYMNODINIIDÆ.

PYROCYSTIS.—Murray.

This genus was established by Sir John Murray for certain globular cells met with in the tropical and subtropical portions of the ocean, which are frequently responsible for the phosphorescence of the sea. The species met with, *P. noctiluca* (of large size, viz. : 600—800 in transverse diameter) was accompanied by a spindle-shaped form *P. fusiformis* Murray, measuring $1,000 \times 160\mu$. Also at Canso a globular form of smaller dimensions ($80 \times 150\mu$) was frequent (Plate I., fig. 3), agreeing admirably in the nature of the protoplasmic contents with *P. noctiluca*. It was also accompanied by a crescentic form (Plate I., fig. 5) $180-250\mu$ in length by $18-25\mu$ greatest width which has been frequently found in the north Atlantic, and described by Schütt as *P. lunula*. The association soon turned out not to be fortuitous, for all stages of segmentation of the protoplasmic contents of the globe into 4, 8, 16, 32 balls were observed (Plate I., fig. 4), which eventually developed into crescents within the shell of the globe before they were freed by the bursting thereof. The curiously curved shapes which they acquire during their imprisonment are explained by their crowded arrangement. A further phase of development, in virtue of which six Gymnodinia (fig. 5, 5a) are formed within the crescent (one of which is distinguished from the others by a red spot), was observed such as is figured by Hensen (No. 1, Plate IV., fig. 30). Schütt figures examples with only a single Gymnodinium in the interior. It seems improbable that only one species of Gymnodinium passes through this remarkable cycle, and further studies may reveal globular and fusiform cystic stages for other species. Another cyst occurring along with the foregoing, but exceeding it in size (diameter $200-250\mu$) is probably related. It was observed frequently with daughter-cells sixteen in number of characteristic form (Plate I., fig. 6) and size ($50-56\mu$), one alone of which possessed a rosy spot. The cells afterwards undergo encystment when, within each, eight granddaughter cells of similar but smaller size, 12μ , are developed, one only of them retaining the original rosy spot.

In July and August there was frequently observed within dead Copepods or their appendages, a small pink Gymnodinium (Plate I., fig. 7) of subglobular form, 40μ in its longer diameter, generally in an encysted condition, the nuclei recalling the structure figured by Schütt (No. 2, Plate XXII., fig. 73). It is probably a stage in the development of a larger form.

POUCHETIA.—Schütt.

This genus has been formed by Schütt for the purpose of separating certain chlorophyllous species of Gymnodinium which are also distinguished, alone among marine forms, by the possession of more or less complicated organs of vision.

About the middle of July at Canso a form was common which possessed the yellow and brown chlorophyll of Schütt's *Gymnodinium geminatum*, disposed in strands, but in addition a well marked pigment spot with lens of the form represented in Plate I., fig. 8. As this is manifestly of the same character as the stigma of the other species of Pouchetia, that genus must be held to include also chlorophyll-bearing forms. The present species, which on account of its colour may be called *P. ochrea*, was always observed encysted, a single individual or one in various stages of division being inclosed in the cyst. The latter envelopes the body closely, and is not the thick gelatinous investment seen in *G. geminatum*. The undivided cell measures $55 \times 45\mu$ but when division is far advanced it gains a length of 100μ . The form and position of the lens and pigment body of the stigma may be gathered from the figure. The latter shows that the two daughter individuals, instead of being in contact by similar surfaces, have their opposite poles adjoining.

SESSIONAL PAPER No. 22a

GYMNODINIUM.—Bergh.

A form (Plate I., fig. 9) was observed on one occasion in July, 1902, which is possibly referable to *G. gracile* Bergh. It is bright pink in colour and measures 125μ in its long diameter. In form it recalls *G. fusus* Schütt.—No. 2, Plate XXV., fig. 81.

PERIDINIIDÆ.

DINOPHYSIS.—Ehrb.

This genus is at once recognized by the compression from side to side and the far anterior position of the transverse furrow. Two species are common at Canso and at Malpeque; *D. norvegica* Clap. and Lach. (Plate I., fig. 10), the commonest form, measures 65μ in its long diameter, and can be distinguished by the coarse reticulation of the shell, the green chromatophores and the curved posterior point.

D. rotundata (Plate I., fig. 11), the next most frequent form, measures little more than 50μ in length, lacks chromatophores, possesses protoplasm of a very pale pink hue, often much vacuolated, and has a shell decorated with very minute round points. The anterior half of the shell projects considerably beyond the girdle, which is notably not the case in *D. norvegica*. A third species of ovate outline with green chromatophores, but smaller than either of the foregoing ($35 - 45\mu$), resembles *D. ovum*, Schütt, in form, but is not so large.

PYROPHACUS.—Stein.

P. horologium Stein (Plate I., fig. 12) is distinguished by the fact that its two valves are subequal and much flattened, so that it presents to the observer one or other of its poles, being then distinguished by the broad transparent flanges overhanging the transverse furrow. The chromatophores are yellowish green. It owes its specific name to the watch-glass shape of its valves. These measure 72μ in diameter. It was common in the middle of July.

PROTOCERATIUM.—Bergh.

P. reticulatum Clap. and Lach, is a comparatively small form which no doubt frequently eludes observation. It is marked by the coarse reticulation of the shell (Plate I., fig. 13), which is divided off into angular areas bounded by ridges and provided with a central pore, also by the deep diatom-brown of its chromatophores. It occurred at Canso in July and August, the specimens measuring 46μ in the longest diameter.

GONYAULAX.—Stein.

G. spinifera Clap. and Lach. resembles the foregoing in its colouring, but has a characteristic tubular prolongation of its anterior pole and carries spines on the posterior pole at the sides of the well-marked longitudinal furrow (Plate I., fig. 14). The transverse furrow is markedly spiral. The long diameter is 80μ . It was observed in one gathering from Grand river, Malpeque in 1903.

PERIDINIUM.—Ehrb.

To this genus there belong several species which are often most abundant in the plankton, and constitute a very important element of the food of those animals which are dependent on such microscopic nourishment. Four species were recognized at Canso, not necessarily occurring at the same time, but frequently overlapping in their maximum periods. Three of these have the angular outline which is characteristic of

6-7 EDWARD VII., A. 1907

most of the species, while the fourth is oval in contour. The three former, however, differ in dimensions and in colour. *P. divergens* v. *reniforme* Ehrb. (according to Jorgensen, No. 3, p. 36—*P. depressum* Bailey) is the largest (120μ in transverse diameter) and has protoplasm of pinkish hue (Plate I., fig. 15, a. & b.). *P. lentidulare* Ehrb. (Plate I., fig. 16), is greenish, and measures only 80μ across, while *P. pellucidum* (fig. 17) is only half as wide, more pyriform, and quite colourless. At the beginning of August, 1902, a variety of *P. divergens* made its appearance, in which the pink colour was more intense, the reniform outline, when observed from one of the poles (fig. 15 c.) more marked, and the vertical height from pole to pole less. *P. ovatum* (Pouchet) Schütt (fig. 18) shares the pink hue of *P. divergens*, but is oval in outline except for the short tube of the apical pole. Its transverse diameter is 75μ and its vertical 55μ . The ventral fissure is bounded by two sharp teeth.

Diplosalis lenticula Bergh, was observed along with the foregoing, with which it may easily be confused on account of its oval outline, but it differs from it in possessing only five pre-equatorial plates instead of seven, and in the fact that the transverse furrow has a strictly equatorial and not slightly spiral course. Its dimensions are rather smaller.

CERATIUM.—*Schrank.*

This genus, like *Peridinium*, furnishes a very large part of the floating food-material of the ocean. It differs from it in having the tendency to develop flotation organs either in the form of three horns (one apical, two antapical), or by the acquisition of an exceedingly long and slender form like some of the plankton diatoms. The plates of the apical pole are fewer in number, there being only three pre-equatorial plates.

The commonest species at Canso is the widely-distributed *C. tripos* Nitsch, and the variety of this very variable species which is most abundant is *C. tripos macroceras* (*forma intermedia*) of Jorgensen. It will be seen that my sketches (fig. 19) resemble his figure (No. 3, Plate I., fig. 10) very closely. Another form in which the horns are much longer in proportion to the width of the body was commoner, earlier in the year, and is perhaps the form '*scoticum*' of Schütt, while isolated examples of a form with the antapical horns very slightly curved towards the apical pole approach the variety '*arcticum*.'

C. fusus (fig. 20) seems less variable than the foregoing. The right antapical horn is more or less suppressed, and the whole cell attains a length of over 1 mm.

GYMNASIER.—*Schütt.*

One or two examples of the singular little form *G. pentasterias* Ehrb. (fig. 21 a. & b.) were met with in July. The body is oval, 44μ in long diameter, and is distinguished by the presence of two intracellular skeletal plates of resistant siliceous material. After boiling with nitric acid the delicate form of these plates (No. 2, fig. 216) becomes more evident. This form is frequently regarded as one of the *Silicoflagellata* (p. 9).

DIATOMACEÆ.

Of this group a very large number of marine forms are known, some of them admirably adapted as Schütt has pointed out (*Pflanzenleben der Hochsee*) for a floating life; others on the other hand confined to a littoral life by the absence of such provisions. The adaptation for floating is generally achieved by a reduction in the amount of silica in the valves of the shell, and in addition by the flattening of the whole cell into a disc-like form or its elongation into a more or less needle-like shape. *Coscinodiscus* and *Rhizosolenia* exhibit the two extremes of these modifications, and both genera were frequently represented in the tow-nettings at Canso. Of the

SESSIONAL PAPER No. 22a

former genus some very large examples are met with; *C. concinnus* e.g. (Plate II., figs. 1 and 2) in which the sculpture of the valves is exceedingly fine. *C. oculus iridis* and *C. centralis* are smaller and have more obvious sculpture which frequently suggests artificial engine-turning (fig. 3). *Actinoptychus undulatus* Ralfs, *Actinocyclus Ralfsii* Smith and *Paralia sulcata* (Ehrb.) Cleve are not uncommon (figs. 4, 21a and b, 23).

The commonest species of Rhizosolenia was undoubtedly *R. styliiformis* Brightwell, in which the adjacent ends of the valves have very characteristic fitting surfaces (Plate II., fig. 6), but *R. setigera* Bright. was also frequently represented, in which the valves terminate in long spines with a peculiar spear-blade-like enlargement towards the middle of their length (figs. 5 and 7).

Still another type of plankton diatom is that which is furnished with delicate bristles which enormously increase the amount of surface in contact with the water without materially adding to the weight. To this type belongs the genus *Chaetoceras*, which is not only rich in species but is profusely represented by individuals in the plankton.

CHAETOCERAS.—Ehren.

In the following account of this essentially planktonic genus, I shall follow the excellent paper of Gran (No. 4), which unfortunately I had not at my disposal when I made the sketches of the forms observed at Canso.

The genus is not only one of the most characteristic, but one of the most abundant of plankton diatoms. It embraces a number of species, the synonymy of which is much confused. I shall only attempt to enumerate those of the diagnosis of which I feel certain. As Gran remarks, the arrangement of the chromatophores is often of considerable diagnostic value: I have found this so in the sketches where it has been noted.

The various species of *Chaetoceras* generally form chains of more or fewer individuals. Each individual is a shorter or longer cylinder, more or less flattened, the shell bounding which is formed of two valves with an intermediate hoop. The faces of the valves where they come in contact with adjoining individuals are provided with two bristles or setæ, which interlock with the adjoining bristles and diverge from the surface of the chain at an angle generally characteristic for the species. The more littoral species form spores which are peculiar in shape and decoration for the various species, but no such spores were observed during the summer at Canso.

Gran recognizes two subgenera *Phaeoceras*, in which the brownish chromatophores penetrate into the setæ (which are frequently spinous), and *Hyalochaete*, in which the setæ are hyaline.

To the former group belongs *C. boreale* Bail. (figs. 9 and 10), the cross section of the cell of which is nearly cylindrical ($24 \times 22.5\mu$), and the setæ, which are over 5 mm. long and spinous, are situated in the sagittal plane. The foramina, gaps in the chain between the individual cells, are hexagonal in outline. This form was common at Canso during July and August.

Of the species belonging to the second group, I shall first refer to *C. decipiens* (Plate II., fig. 8) which attracts attention on account of its considerable width which I have measured up to 75μ . The terminal bristles of the chain are shorter and stouter, bear transverse striæ, and are directed nearly parallel to the chain. It was the commonest species observed at Canso. Less common members of the same group were *C. didymum* Ehrb., *C. lacinosum* Schütt and *C. diadema* Ehrb. The first may be recognized by the lyrate foramina caused by a protuberance on the surface of the concave valves as well as by the position of the two chromatophores which fit up against these. In the second (fig. 1), the terminal setæ are wider in the middle and decorated with interrupted spiral lines of thickening. The third species betrays itself, when seen from the valve-surface, by the circumstance that of the four setæ two are in a sagittal plane and two in opposite directions of the transverse axis.

BACTERIASTRUM.—Schadb.

This genus is also exquisitely adapted for its floating life. It is composed of cylindrical joints like *Chaetoceras*, but instead of each cell having only four bristles, sixteen may be observed in an end view projecting from the interval between contiguous cells and bifurcating as they radiate outwards (fig. 13). The species, *B. varians*, was observed towards the middle of September, the joints measuring $50 \times 25\mu$, the basal part of the bristles 25μ , and the forks 60μ .

SKELETONEMA.—Grev.

This is another similar form, which, however, appears to depend on the slenderness of its cylinders and the tenuity of its siliceous coat for its floating power. The species observed, which is also recorded from the North Sea, is *S. costatum* (fig. 14), portions of the slender cylinders being ribbed. The frustules in the specimens observed measured about 40μ in length by 4 in width.

In addition to the foregoing plankton diatoms, many other of more littoral habit were frequently taken in the tow-nets. Especially is this true of certain forms like *Nitzschia closterium* (fig. 18), or *N. longissima* (fig. 19) whose shape favours flotation, or like *Striatella* (fig. 15), whose siliceous shells are thin, and specific gravity therefore small, or like *Licmophora* (fig. 16a and b) which are frequently found attached to floating or swimming organisms like Copepoda. But there are again other forms, the shape of whose aggregations adapts them to a floating life; such are *Synedra nitzschoides* (fig. 22), *Nitzschia paradoxa* (fig. 17), whose cells perform the most remarkable evolutions, *Tabellaria* (fig. 24), and *Rhabdonema* (fig. 20).

PROTOCOCOIDEÆ.

TROCHISIA.—Kuetzing.

This genus includes certain unicellular forms with a thick cell-wall generally ornamented with spines or ridge-like projections.

Tr. Clevei Lemm., or a representative of this species, occurring at the same time which the spines are imbedded (Plate III., fig. 1); it was common towards the end of July. The dimensions (the cell 31μ , spines 10μ) are somewhat different from those recorded by Lemmermann (No. 5), and the ends of the spines have more than two or three points, but these differences do not appear to have more than varietal significance.

Tr. Clevei Lemm., or a representative of this species, occurring at the same time as the above, agrees on the whole in its dimensions (cell $72-93\mu$, spines $98-51\mu$), with Lemmermann's account, but the conformation of the spines is slightly different. There is no gelatinous envelope, the cell-wall is thin and the hyaline spines are often 'flaming' or divided at the end, and may vary in length and strength (Plate III., fig. 2).

Tr. dictyon (Joerg.) Lemm.—I find a single example of this species, the cell-wall of which is marked off by ledge-like ridges into quadrangular or pentangular areas, recorded in my sketches in September, 1901 (fig. 4). The cell measures 96μ in transverse diameter.

HEXASTERIAS.—Cleve.

Several examples of the type species of this genus—*H. problematica* Cleve (Plate III., fig. 5), occurred towards the end of August, both in 1901 and 1902. It is characterized by 6 (or 7) arms projecting from a central disc about 40μ in diameter. The arms end in sharp recurved teeth. The contents become brown with chloride of zinc, but neither the arms nor the disc show a cellulose reaction. This form has hitherto

SESSIONAL PAPER No. 22a

been recorded from the North Sea, Iceland, and the neighbouring parts of the north Atlantic.

Another form was observed in August, 1902, which appears to be allied to the above, and which may provisionally be referred to the same genus. One surface of the central disc in this instance is vaulted, and each of the six projections is divided into three tapering curved spines, the middle one of each group being curved inwardly towards the flatter of the two surfaces of the disc. In the specimen observed the disc measured 68μ , the spines 40. For convenience the species may be called *H. spinatrida* (Plate III., fig. 6.)

I was inclined to refer to the same group an organism which was met with once in an oyster's stomach at Malpeque (Plate III., fig. 4), and which is evidently identical with Hensen's 'Sternenhaarstatoblast' (*l.c.* Taf. IV., figs. 23 and 24). I notice, however, that Hensen describes ciliation in the interior of his cysts.

HALOSPHERA—Schmitz.

This genus occurs in the form of free-swimming globular cysts, within which the contents break up into swarm-spores.

H. viridis Schmitz, first observed at the Naples Zoological Station, is a very familiar and abundant element of the plankton in June and July. The youngest cells have diffused chlorophyll with scattered starch-grains and the nucleus is not visible. Eventually the protoplasm exhibits peripheral divisions. It is segmented into numerous cells, still connected by protoplasmic bridges (Plate III., fig. 7), which soon are broken, the individual cells fashioning themselves into monadiform swarm-spores (fig. 7a). The largest cells measured were 360μ in diameter.

SILICOFLAGELLATA.

'Cells without external membranes with one or two flagella, one central nucleus and frequently many yellowish brown chromatophores, living within a shell formed of solid or hollow siliceous rods. Reproduction unknown.'

The above is the diagnosis given by Lemmermann of this singular group of which I have found for the most part only empty shells belonging to the genera *Distephanus* and *Ebria*.

DISTEPHANUS—Stöhr.

D. speculum (Ehrenb.) Haeckel is met with in a variety which appears to be that named *regularis* by Lemmermann, as the radial spines from the basal hexagon (20μ in diameter) are equal in length (15μ).

EBRIA—Borgert.

Ebria tripartita (Schum.) Lemmermann (Pl. III., fig. 9) was not uncommon in August. The genus differs from *Distephanus* in having a solid skeleton and two flagella. It has hitherto been recorded from the Baltic and the Gulf of Naples. The shells (which measure 20μ in diameter) or fragments thereof, frequently occur in the stomachs of oysters at Malpeque.

FORAMINIFERA.

Comparatively few forms were observed in the plankton, and some of these were undoubtedly young examples of bottom forms swept up by storms. Only once in September did a thoroughly planktonic form make its appearance, viz., a young *Globigerina* (*æquilateralis* ?) 150μ in diameter with short delicate spines.

6-7 EDWARD VII., A. 1907

Examples of a Pulvinulina and a Discorbina (Pl. IV., figs. 1 and 2) were less uncommon, the former indeed very frequent in July and August, while a few examples of a Spirillina (fig. 3) were observed in the latter month. A re-examination of these after a study of the benthonic forms would render a closer diagnosis possible.

RADIOLARIA.

Very few members of this class were observed at Canso. Jorgensen records some sixty species off the west coast of Norway, but only three of these were found at Canso. It appears that they are commoner in the open ocean. Of those found, two belong to Hæckel's group of the Acantharia and one to the Nassellaria.

Acanthonia echinoides (Clap. and Lach.) Hæckel (Pl. IV., fig. 4) was abundant in August in both of the years spent at Canso. So abundant, that when sporulating it could be seen in the form of distinct pink dots in the plankton.

The second and much rarer Acantharian is *Acanthostaurus pallidus* (Pl. IV., fig. 5) while the Nassellarian, only observed on two or three occasions, is the *Plagiacantha arachnoides* Clap. (fig. 6). ..

INFUSORIA CILIATA.

This class is represented in the plankton chiefly by the family of the Tintinnidæ, a group exquisitely adapted for pelagic life. It belongs to the order Heterotricha, sub-order, Oligotrichidea, in which the ciliary covering is reduced to a few specialized tracts, that round the mouth being the most important. A genus, Strombidium, belonging to another family, Halteridæ, is, however, met with under the same circumstances, and shares the peculiar adoral series of membranelle.

Strombidium sulcatum (C. and L.) was described from salt water at Bergen, but was observed to be very frequent at Canso in August, 1901. Its outline is somewhat oval, but the posterior end is provided with certain characteristic furrows and the anterior with a projecting beak broader at its extremity than at its origin. The observed dimensions were: $440 \times 266\mu$.

TINTINNIDÆ.

In discussing this interesting group of characteristic plankton Infusoria, I shall follow the account given by Jorgensen in his recent discussion of the Norwegian forms. (No. 6.)

I have reproduced in Plate IV., fig. 7, the representation of the characteristic ciliation of this group given by Lang in his Text-book (Protozoa, fig. 53).

TINTINNUS—Schrank.

This is characterized by the tubular case being open posteriorly. *T. acuminatus* Clap. and Lach. (fig. 8) was seen only on one occasion, but it is readily recognized by the ridges which occur on the posterior third of the case. The specimen observed measured $258 \times 17\mu$. *T. obliquus* Clap. et Lach. (fig. 9) was only seen in July, both in 1901 and 1902. Apart from its smaller dimensions ($80 - 100 \times 14 - 19\mu$), it may be recognized by the absence of the flaring anterior aperture.

AMPHORELLA—Daday.

This, like most of the other genera, has no posterior aperture. The commonest species of this genus, *A. subulata* (Ehrb.) Dad. (fig. 10), is exceedingly abundant in the plankton in July and August. Its case is translucent, is furnished with a long posterior spine and is at once recognizable by the series of denticulated rings which

SESSIONAL PAPER No. 22a

adorn its anterior end and seem to indicate additions to the length of the tube. It appears to constitute a considerable element of the food of the oyster in Malpeque bay.

TINTINNOPSIS—Stein.

This differs from the foregoing in having the case beset with foreign material. Two of the species commonly occurring at Canso were easy of diagnosis, viz.: *T. campanula* (Ehrb.) Dad. and *T. beroidea* Stein (figs. 12 and 13). The dimensions of the average examples were in the former case $150 \times 130\mu$; in the latter $43 \times 19\mu$. But in addition to these, forms similar in their general shape to *A. subulata* were very common. *T. davidow* Daday has a total length of 95μ of which 65μ belongs to the spine; it is 40μ wide. The specimen figured (Plate IV., fig. 14) exhibits lines of growth and a fine punctulation of the case, where unconcealed by the foreign material. Another variety measures 45μ in width and 240μ in total length, of which 95μ belong to the spine, which is set on obliquely to the case. No rings were observed in this variety, and the punctulation was confined to the spine (Plate IV., fig. 15). *T. cylindrica* is distinguished by the peculiar form of the aboral end of the case, which lacks the spine of the above, but has a short handle-like process of irregular outline covered with foreign matter.

T. lobiancoi (fig. 16), a cylindrical form, test-tube like in shape, ($190 \times 45\mu$) may possibly be a variant of Jorgensen's *T. subacuta*, but no annulations were observed.

CODONELLA.—Haeckel.

C. ventricosus (Plate IV., fig. 11) was not uncommon in July. Its form, small dimensions ($60 \times 42\mu$) and constricted neck sufficiently distinguish it.

C. lagenula Clap. and Lach.—Common in Malpeque bay, is similar in form, but has no foreign particles adhering to the shell.

PTYCHOCYLIS.—Brandt.

P. urnula (Clap. et Lach.) Brandt is a small form very easily recognized by its hyaline case, which is provided with two annular swellings and a thinner slightly inverted and toothed lip (Plate IV., fig. 19). The example observed approached Jorgensen's var. *minor*, in its dimensions ($96 \times 75\mu$).

CYTTAROCYLIS—Fol.

This genus is characterized by a wall formed of two lamellæ united by transverse plates. The most abundant form at Canso was *C. denticulata* (Ehrb.) Fol var. *gigantea*, Brandt (Plate IV., fig. 18), the tubes of which with their delicate reticular sculpture and toothed orifice were very abundant in the plankton in June and July. The average dimensions of the Canso examples were $470 \times 70\mu$, but shorter and stouter specimens occurred, approaching the variety *typica*, in which the length is only three times the breadth. The sculpture ceases as the case narrows to its delicate terminal spine, which is as a rule sharp, but occasionally terminates in a knob.

ECHINODERM LARVÆ.

Three of these were observed, viz., (1) The Pluteus of *Strongylocentrotus dröbachiensis* in its second stage. In addition to the two pairs of ciliated epaulettes at the base of the post-oral and posterior dorsal processes, there is a posterior ring. The greatest length of the larva, which occurred in the end of June and the beginning of July, is 1.25 mm. (Plate V., fig. 1). At a later date (2) an Ophiopluteus made its

6-7 EDWARD VII., A. 1907

appearance on July 11 (fig. 2), and a comparison of my sketches with Mortensen's figures (Nordisches Plankton IX., 16) induces me to refer it to *Ophioglypha*, of which *O. robusta ayres* is the common species at Canso. My sketches, however, are not sufficient to give an accurate picture of the form of the skeleton (Plate V., fig. 2). Still later, on July 18, (3) the first Bipinnariæ of *Asterias vulgaris* were recorded (fig. 3).

TREMATODES.

A few examples of what has been supposed to be the pelagic egg of a Trematode were detected in both years; such at least, is the interpretation placed upon these by Canu (Ann. de la Station Aquicol. de Boulogne-sur-mer, Vol. I., pt. 2, p. 112, Plate VII., fig. 8-9). The Canso specimens are longer and comparatively slenderer 290μ (of which 182 to tail) \times 50, while Canu's measure 150×42 .

The larvæ of *Hemiurus appendiculatus* Rud, and *Derogenes varicus*, O. F. Müller, diagnosed by Dr. Stafford, are found occasionally free, as well as in the interior of Copepods (*Acartia* sp. at Malpeque).

ANNELIDA.

Of the two families which are exquisitely pelagic in their habit, the Alciopidæ and the Tomopteridæ, only the latter was represented in the tow-net takings at Canso, and that by a single example taken out at sea in the end of August. (Plate V., fig. 5). From Apstein's account of the Tomopterids of the Plankton expedition, one would have expected that it would have turned out to be *T. helgolandica* or *T. septentrionalis*, but his excellent account enables me to diagnose it as a young example of *T. Mariana*. It measured 1.25 mm. in length, had the cephalic tenacles the two pair of tentacular cirri and five pair of parapodia developed, of which the two first carried yellow (phosphorescent?) 'rosettes' on the basal joint, while the middle line of the back had some twelve distinct pink spots, which were also present on the tentacular cirri of the parapodia. No rosette was observed on the fin of the third pair of parapodia.

LARVAL FORMS.

Before any satisfactory account can be given of these, it will be necessary to work over the adult Annelids of the region. Two Spionid larvæ, one of them *Polydora ciliata*, were very common, but I propose to confine myself here to registering the occurrence of some forms of particular interest. The Polygordius larva (Plate V., fig. 6) was frequent in July, as was also a Mitraria larva (fig. 7), but my attention was more arrested by a larva developing within an egg-membrane of peculiar character, of the systematic position of which I have not been able to satisfy myself. The embryo in question was first observed towards the end of July in an early stage of segmentation, with a large space between it and the peculiar shell of some 225μ in diameter. On the inner surface of the latter were to be seen numerous pear-shaped vesicles apparently opening to the exterior (fig. 8). Towards the end of the month a single ciliated band had been established and later a well-marked anterior bunch of cilia as well as a posterior ring (fig. 9).

Still later two bunches of provisional setæ, some 130μ in length, five in each bunch made their appearance (fig. 10), two brown eye-spots became obvious, and two caudal (sensory?) organs were observed. The shell lost the peculiar pear-shaped vesicles as development advanced; it was perforated by the cilia and bristles, and eventually was ruptured by the escape of the larva. This I observed towards the middle of September, but only detected a single example of such a free larva.

Another developing embryo of larger size, 555μ , related to the above, was also observed less frequently in September. The shell lacked the vesicular structures observed

SESSIONAL PAPER No. 22a

in the other case, but had a peculiar superficial sculpture and certain oval depressions (fig. 11) not related to the two ciliary rings whose cilia projected through the shell in separate tufts. Several of the oval areas were counted in front of the prostomial ring.

Since the above was written Leschke's paper* on the pelagic Polychæte larvæ of the Bay of Kiel has appeared, in which he records having met on one occasion with a larva similar to the former of these. He also cites previous records of similar occurrences which had escaped me, and from which I am able to state that the Canso larvæ obviously belong to the genus *Nerine*.

POLYZOA.

The only larval Polyzoan met with was the *Cyphonautes* larva of *Membranipora* sp. (fig. 12), which was abundant in June and July.

CRUSTACEA.

CLADOCERA.

Two genera were represented abundantly at Canso, viz.: *Podon* and *Evadne*. Of the former there were two species appearing at the end of July and of August respectively. I have not been able from my sketches to determine these with certainty, as the diagnostic features given by Timm and Hansen (the number of bristles on the exopodites of the various legs) are not recorded there. I suspect the earlier species, however, to be *P. polyphemoides* Leuckart, on account of its shorter tail lancets and smaller size, and the latter to be *P. intermedius* Lilljeborg. I find my sketches record that the caudal lancets of the larger species (Plate VI., fig. 1) are tinged with violet and toothed, also that the sculpture of the surface of the shell is different in the two species (figs. 1 and 2).

The two species of *Evadne*, however, are obviously *E. Nordmanni* Loven, and *E. spinifera* P. E. Müller, the former characterized by the greater elongation of the shell and the latter by the spine which it carries (fig. 3). The former species was abundant at the end of June, the latter common at the end of August. The first winter egg was observed in it on September 6.

OSTRACODA.

Only two species of this order were observed, neither belonging to the genus *Conchoecia*, so it is possible that the few examples observed are fresh water forms swept into the plankton.

COPEPODA.

Comparatively few of the numerous species of this interesting order occurring have been definitely diagnosed. The commonest forms are, however, recorded here.

SUBORDER GYMNOPLA.

CALANIDAE.

Of this family the largest representative, a very abundant one in the earlier part of the summer, was *Calanus finmarchicus* Gunner. It attracts attention by its

*Leschke, Beiträge zur Kenntniss der pelagischen Polychaetenlarven der Kieler Förhde. Wissenschaftl. Meeresunters: VII.-123. Cunningham and Ramage, Trans. Roy. Soc., Edin., XXXIII. Claparede & Metschnikoff Z. W. Z. XIX, p. 329. Krohn & Schneider Müller's Archiv, 1867, p. 498.

large size and by its transparent pale pink colouration. Fig. 4, Plate VI., is after Giesbrecht's figure of this species, and serves to call attention to the arrangement of the appendages in the order.

Pseudocalanus elongatus Boeck (Plate VI., fig. 5) was exceedingly abundant in July and August, and can be readily recognized by the orange pigment and the green of the vulvar region, as well as by the morphological features described by Giesbrecht. The eggs, about 100μ in diameter, are in a loose cluster, from 7 to 13, and spermatophores of 310μ length were frequently observed with a longer or shorter tube. The individuals frequently carried clusters of a diatom (*Lichmophora*, sp.). As Giesbrecht has noticed, the larva of *H. appendiculatus* (p. 12) is found in this copepod, but it also occurs in *Acartia bifilosa*.

CENTROPAGIDAE.

Both *Centropages hamatus* Lilljeborg (Plate V., fig. 6), and *C. typicus* Lilljeborg were observed, the latter much less abundant and appearing considerably later than the former. They may be readily distinguished by the different armature of the genital segment of the female.

Temora longicornis, O. F. Müller, a northern form, was also abundantly represented.

PONTELLIDAE.

Tortanus.—This generic name has recently been substituted by Giesbrecht for *Corynura* (preoccupied), and expresses the remarkable distortion of the abdominal region which characterizes the genus. One species of this genus (*T. discaudatus* I. C. Thompson and H. Scott), Plate VI., fig. 9, was exceedingly common at Canso from the end of July to the middle of August. It was first recorded by the authors named from the Gulf of St. Lawrence and afterwards observed by Wheeler at Wood's Hole and described as *Corynura bumpusii*. I have little to add to the excellent account furnished by him except to suggest an explanation for the distortion of the furcal region. The second post-genital segment of the female carries a bunch of stiff hairs adjacent to that on the first, while the second abdominal segment of the male has certain grooves on the chitinated projection formed by the right posterior angle, as well as a few scattered bristles. In the right antenna of the male the first joint distad of the knee (19-21) carries two pectinate ridges, while the 17th and 18th joints have one each (fig. 11).

The explanation for the distortion of the abdominal region of the female (which is also transmitted in a less degree to the male) is furnished, I believe, by the mode of attachment of the spermatophore, which I had occasion to observe very frequently. The spermatophore itself is over 1 mm. long by 125μ wide. It is attached to the genital segment, in the ordinary way by a conical cement piece, but a much larger piece of yellowish cement is plastered on to the large right furca and its spine, and is connected with the beginning of the efferent canal of the spermatophore by a solid cord of cement of the same appearance (fig. 10).

Some cases were noticed in which an attempt had been made to attach a second spermatophore; in such the supplementary supporting patch of cement did not succeed in finding anchorage.

SUBORDER PODOPLEA.

CYCLOPIDÆ.

Oithona plumifera Baird (fig. 8) is one of the commonest forms of this section, and apart from its form can be recognized by the bright-red elongated eye-spot and a certain faint orange tinge in the abdomen. The spermatophores are pyriform, with a short stalk, and measure about 70μ .

SESSIONAL PAPER No. 22a

HARPACTICIDAE.

Microsetella atlantica Brady and Robertson (fig. 12) was frequently taken in the beginning of July. Ripe females are readily recognized by the long setæ, as long as the body (547μ), the orange-red colouring which extends to the eggs disposed in a single packet underneath the abdomen, and the denticulation on the segments.

Harpacticus chelifera (fig. 13) is also common.

AMPHIPODA.

The commonest member of this order in the Canso plankton is *Euthemisto compressa* Goes, Plate VI. fig. 14. It was most abundant in June.

DECAPODA.

Throughout the month of July there was plenty of opportunity of observing the various larval phases of Cancer and two species of Pagurus. One of the latter which occurred towards the end of the month differed from the figures I have studied by the presence of sixteen setæ on the telson, and a rostrum which only reached to the middle of the basal joint of the antennulæ.

UNIDENTIFIED EGGS.

Two pelagic eggs are of very frequent occurrence. One of these (Plate VII., figs. 1 and 2) is that of a gastropod and is contained in a horny capsule which suggests in its shape a low wide-brimmed hat, and resembles closely the figures given by Hensen (l.c. Taf. IV., fig. 25-30) of his 'Barbierbecken-statoblast.'

A further resemblance to his figure 25 is that two eggs are frequently found in the cavity of the capsule. The dimensions, however, of these structures do not agree for whereas the whole capsule of Hensen's statoblast merely measures 200μ , that of the egg in question is $675-775\mu$, the flat rim measuring $140-160\mu$ or so, the capsule proper some 400μ ; its cavity, (or cavities if there are two eggs) $140-150\mu$, and the unsegmented egg about 120μ . Segmentation had begun towards the end of June, the spheres having a certain pinkish hue by reflected light. By the eighth of July the shell and velar cilia could be made out. Larvæ ready to escape were observed up till the middle of August, but were not recognized in the plankton nor referred to the parent mollusc. Fig. 3 is a rough sketch of the shelled larva. I have not found any pelagic gastropod egg-capsules referred to in any of the literature accessible to me.

The second egg-capsule, commoner than the foregoing, I have not been able to localize even as definitely. It has something of the same form (fig. 4), viz., a subglobular capsule of 120μ in diameter, with a thin rim 100μ broad, which, however, unlike the former, does not lie entirely in the same plane, but is often much curled. The capsule is yellowish in colour and the rim shows a network of fine fibres (fig. 5). Empty capsules were common, and embryos (fig. 6) were observed in July and August within others, but I did not succeed in diagnosing them. These egg-capsules, when deserted, were frequently occupied by a species of Chytridium.

Among the numerous gastropod veligers found at Canso that of *Aeolis despecta* (fig. 7) was particularly common and attracted attention by its pellucid shell. Larvæ of the following Pteropods were also found, *Clione aurantiaca* (fig. 8) and two species of Hyalaeacæ (figs. 9 and 10).

TUNICATA.

Although this Phylum furnishes a very large number of interesting forms belonging to the plankton, the only members of it found at Canso belong to the class *Cope-lata*, which permanently retain the tail and notochord of the larval Tunicate.

The excellent account by Lohmann of the forms belonging to this class, secured on the Plankton Expedition, renders diagnosis easy of the three forms found at Canso. Two families are recognized by him, one Kowaleskidæ, distinguished by the absence of the endostyle, the other Appendicularidæ, embracing all the remaining genera of the group. It is to the latter family that all the three species under consideration belong. The first of these to appear during the early part of July was *Fritillaria borealis* Lohmann (Plate VII., fig. 11). The length of the trunk of the example figured was 540 μ , of the tail 1 mm. Projecting from the lateral edges of the trunk posteriorly are two processes like those which mark the species *F. pellucida*. No signs of the 'house' of the species were observed.

The two remaining species belong to the genus *Oikopleura*, distinguished from the foregoing by the plumper form, and by the circumstance that the fin of the tail begins at its attachment, not at some distance therefrom as in *Fritillaria*. *O. labradoriensis* Lohmann replaced the foregoing during the latter end of July, while *O. dioica* Fol was very abundant in the latter part of August. These can be at once separated by the fact that the former has some 16-18 globular 'sub-chordal' cells under the notochord in the latter half of the tail, while *O. dioica* (figs. 12, 13) has two stellate cells in the same position. It is the only dioecious species; ripe females with eggs 70 μ in diameter were observed on August 20. Although like other strictly pelagic creatures for the most part transparent, *O. dioica* shows some traces of pigment in its intestinal tract, the œsophagus having a faint pinkish hue, while the rest of the intestinal wall, and especially the large gastric cells of the left compartment of the stomach, are decidedly violet. This species appears to live on a small green Flagellate (8 μ in diameter) which I only observed in its stomach.

NOTE.—Through inadvertence some of the literature has been cited in the text, and some by the numbers which follow:—

No. 1. Hensen.—Ueber die Bestimmung des Planktons.—Berlin, 1887.

No. 2. Schütt.—Die Peridineen der Plankton-Expedition.—Kiel and Leipzig, 1895.

No. 3. Jorgenson.—Protophyten and Protozoen.—Bergens Museums Aarbog, 1899.

No. 4. Gran.—Protophyta. Norwegian North Atlantic Expedition.

No. 5. Lemmermann.—Nordisches Plankton.—2te Lieferung.

No. 6. Jorgenson.—Tintinodeen der Norwegischen West-Küste. Bergens Museums Aarbog, 1899.

EXPLANATION OF PLATES.

PLATE I.

Fig. 1. *Exuviaella marina*. $\times 600$.

2. *Prorocentrum micans*. $\times 600$.

3. *Pyrocystis lunula*, globular stage. $\times 250$.

4. " with contained crescents.

5. *Pyrocystis lunula* with contained *Gymnodinia*. $\times 250$.

5a. A single *Gymnodinium*. $\times 500$.

6. *Pyrocystis* sp. $\times 150$.

7. *Gymnodinium* sp. $\times 400$.

8. *Pouchetia ochrea*. $\times 400$.

9. *Gymnodinium gracile*. $\times 250$.

10. *Dinophysis norvegica*. $\times 450$.

11. *Dinophysis rotundata*. $\times 450$.

SESSIONAL PAPER No. 22a

- 12 a and b. *Pyrophacus horologium*. × 300.
- 13. *Protoceratium reticulatum*. × 400.
- 14. *Gonyaulax spinifera*. × 400.
- 15 a and c. *Peridinium reniforme*. × 200.
- 16. *Peridinium lenticulare*. × 300.
- 17. *Peridinium pellucidum*. × 300.
- 18. *Peridinium ovatum*. × 400.
- 20. *Ceratium fusus*. × 100.
- 21 a and b. *Gymnaster asterias*. × 600.

PLATE II.

- FIG. 1. *Coscinodiscus concinnus*. × 100.
- 2. *Coscinodiscus* from side.
- 3. *Coscinodiscus centralis*. × 150.
- 4. *Actinoptychus undulatus*. × 250.
- 5. *Rhizosolenia setigera*. × 200.
- 6. *Rhizosolenia styliformis*. × 200.
- 7. *Rhizosolenia setigera*. × 500.
- 8. *Chaetoceras decipiens*. × 150.
- 9. *Chaetoceras boreale*. × 350, end-view of chain.
- 10. *Chaetoceras boreale*. Girdle-view of end of chain.
- 11. } *Chaetoceras dicaeta*, side view. × 250.
- 12. }
- 13. *Bacteriastrium varians*. × 250.
- 14. *Skeletonema costatum*. × 600.
- 15. *Striatella unipunctata*. × 350.
- 16. *Liemophora lingbyei*. × 350.
- 17. *Nitschia* (*Bacillaria*) *paradoxa*. × 400.
- 18. *Nitschia closterium*. × 300.
- 19. *Nitschia longissima*.
- 20. *Rhabdonema* sp.
- 21. *Paralia sulcata*.
- 22. *Synedra* (*Thalassiothrix*) *nitschioides*. × 350.
- 23. *Actinocyclus Ralfsi*. × 250.
- 24. *Tabellaria* sp.

PLATE III.

- FIG. 1. *Trochisia brachiolata*. × 400
- 2. *Trochisia Clevei*. × 300
- 3. *Trochisia dictyon*. × 300
- 4. Undetermined organism, similar to Hensen's 'Sternenhaar-statoblast.'
- 5. *Hexasterias problematica*. × 450
- 6. *Hexasterias spina-trifida*. × 300
- 7. *Halosphæra viridis*. × 150
- 7a. One of the swarmspores.
- 8. *Distephanus speculum*. × 1000
- 9. *Ebria tripartita*. × 750
- 10a, b, c and d. *Eutreptia* sp. growing in old boat at Canso, from side. × 1250,
10a from mouth, 10b to show pyrenoid, 10c development in cyst.
- 11. *Chrysomonad*.

PLATE IV.

- FIG. 1. *Globigerina* sp.
 2. *Discorbina* sp.
 3. *Spirillina* sp.
 4. *Acanthonia echinoides*.
 5. *Acanthostaurus pallidus*.
 6. *Plagiacantha arachnoides*.
 7. Diagram of ciliation of a Tintinnid after Lang.
 8. *Tintinnus acuminatus*. $\times 175$
 9. *Tintinnus obliquus*. $\times 350$
 10. *Amphorella subulata*.
 11. *Codonella ventricosa*. $\times 600$
 12. *Tintinnopsis campanula*. $\times 250$
 13. *Tintinnopsis beroidea*. $\times 600$
 14. *Tintinnopsis davidoffi*. $\times 200$
 15. *Tintinnopsis davidoffi* var:
 16. *Tintinnopsis davidoffi* var *cylindrica*.
 17. *Tintinnopsis lobiancoi*.
 18. *Cyttarocyclus denticulata gigantea*. $\times 125$
 19. *Ptychocyclus urnula*. $\times 250$

PLATE V.

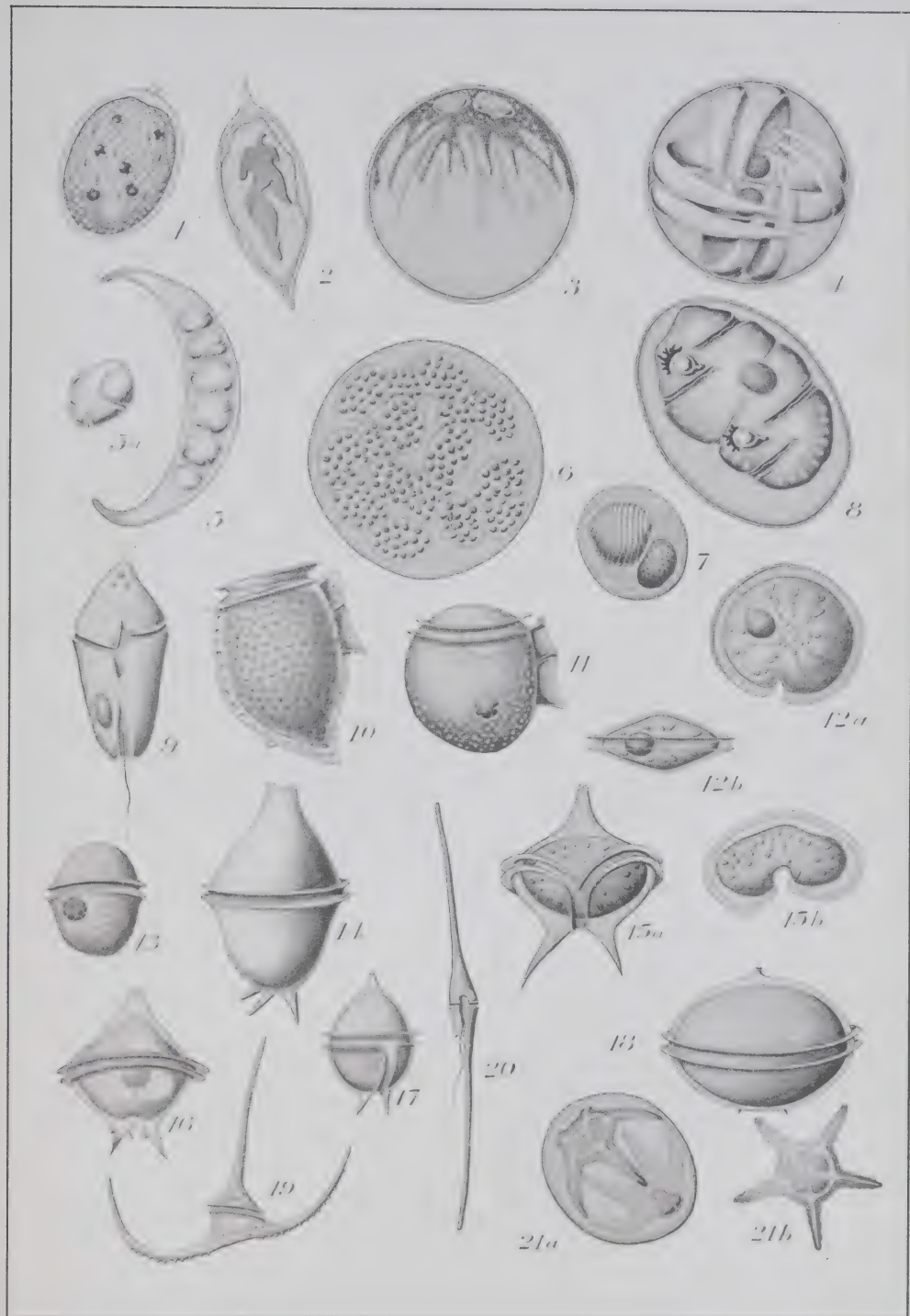
- FIG. 1. *Pluteus* of *Strongylocentrotus droebachiensis*.
 2. *Pluteus* of *Ophioglypha*.
 3. *Bipinnaria* of *Asterias vulgaris*.
 4. Canu's Trematode egg?
 5. *Tomopteris Mariana*.
 6. *Polygordius* larva.
 7. *Mitraria* larva.
 8. { Annelid larva (*Nerine* sp.) within egg-membrane.
 9. }
 10. Provisional setæ of larva.
 11. Another allied larva.
 12. *Cyphonautes* larva.
 13. *Sagitta* sp.
 14. Shell of Pteropod larva?

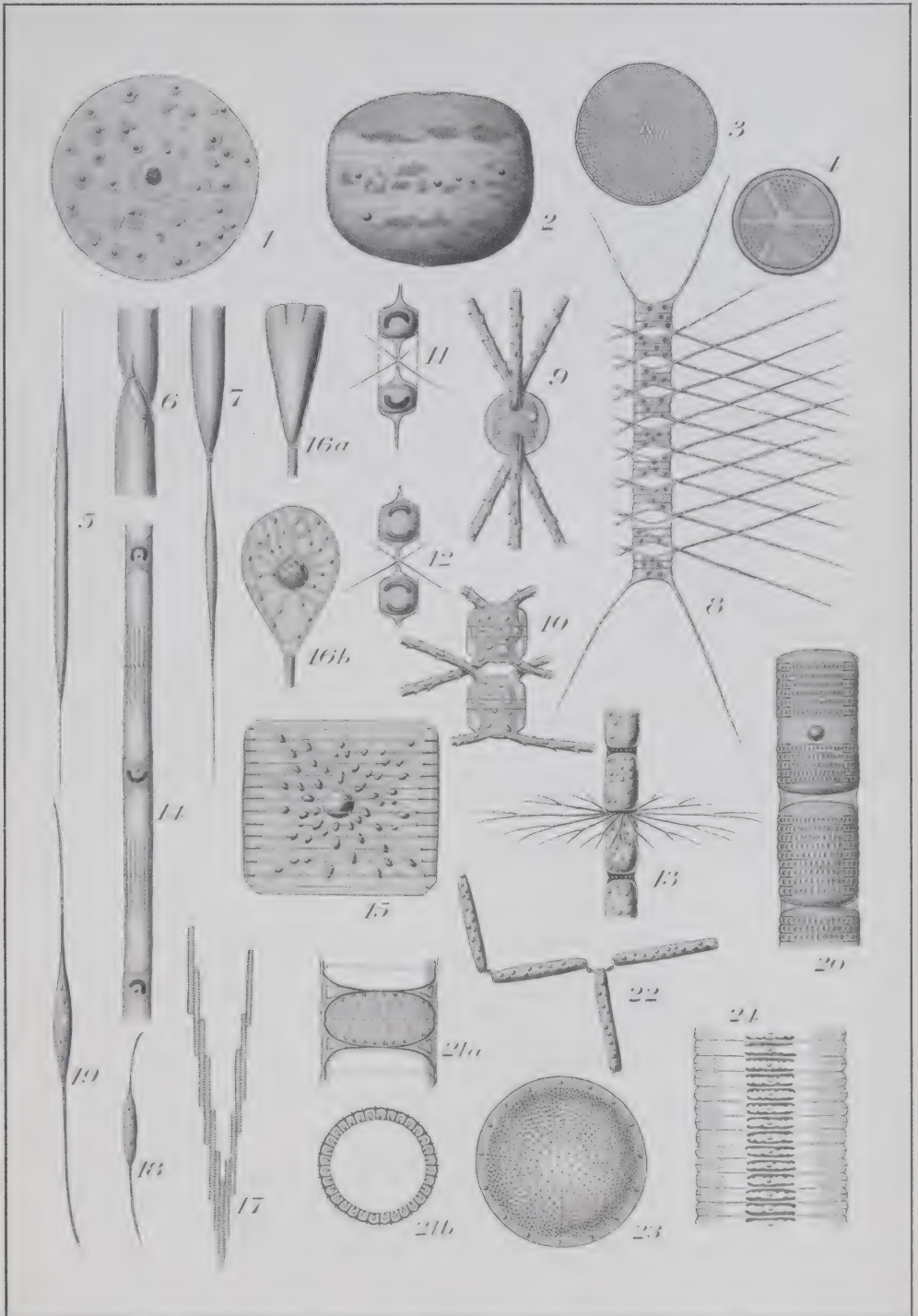
PLATE VI.

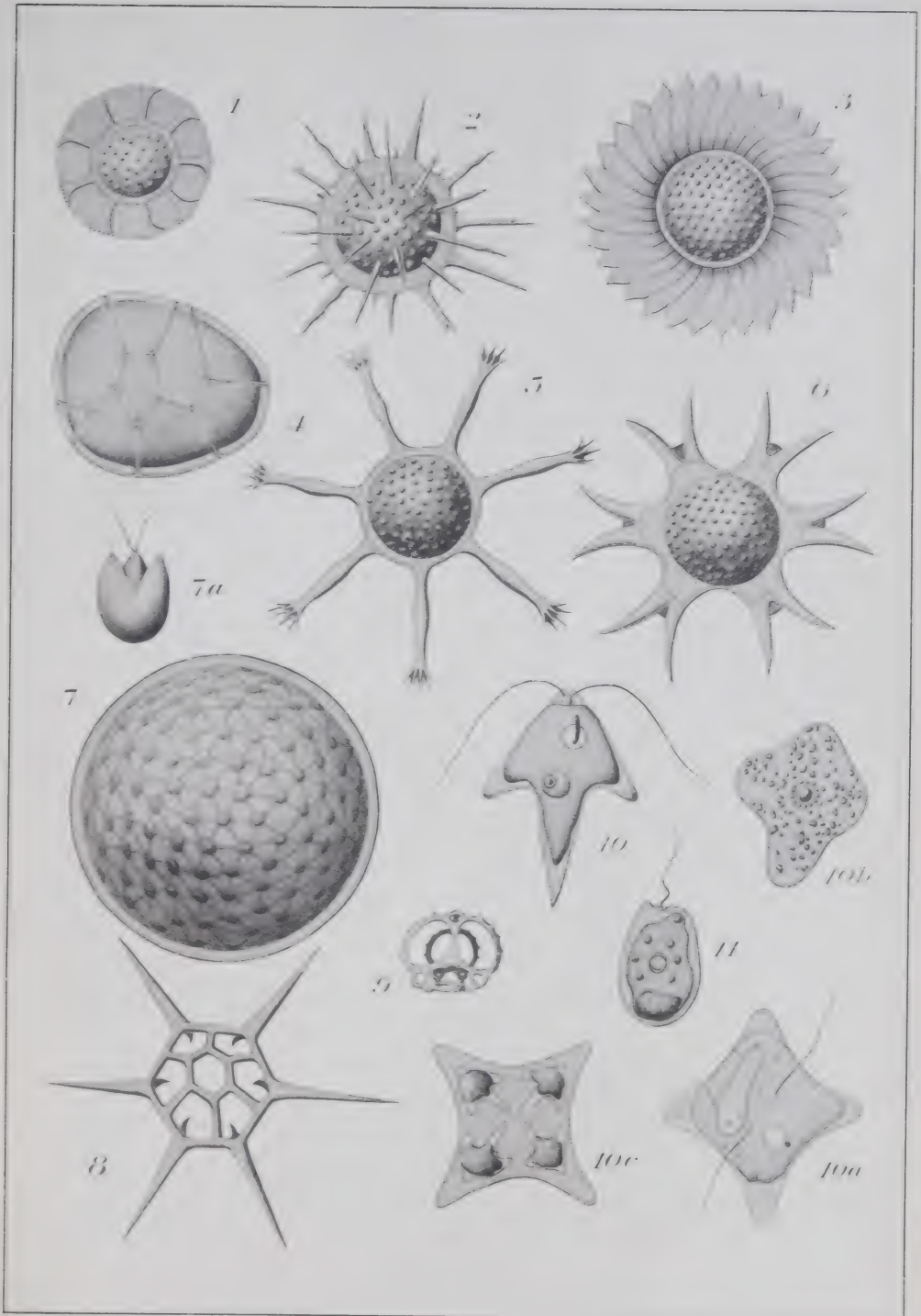
- FIG. 1. *Podon intermedius*.
 2. Sculpture of shell of *P. polyphemoides*?
 3. *Evadne spinifera*.
 4. *Calanus finmarchicus*, after Giesbrecht.
 5. *Pseudocalanus elongatus*.
 6. *Centropages hamatus*.
 7. *Temora longicornis*.
 8. *Oithona plumifera*.
 9. *Tortanus discaudatus*.
 10. Abdomen of *Tortanus* fem. with spermatophore attached to furca.
 11. Part of grasping antenna of *Tortanus*.
 12. *Microsetella atlantica*.
 13. *Harpacticus chelifer*.
 14. *Euthemisto compressa*.

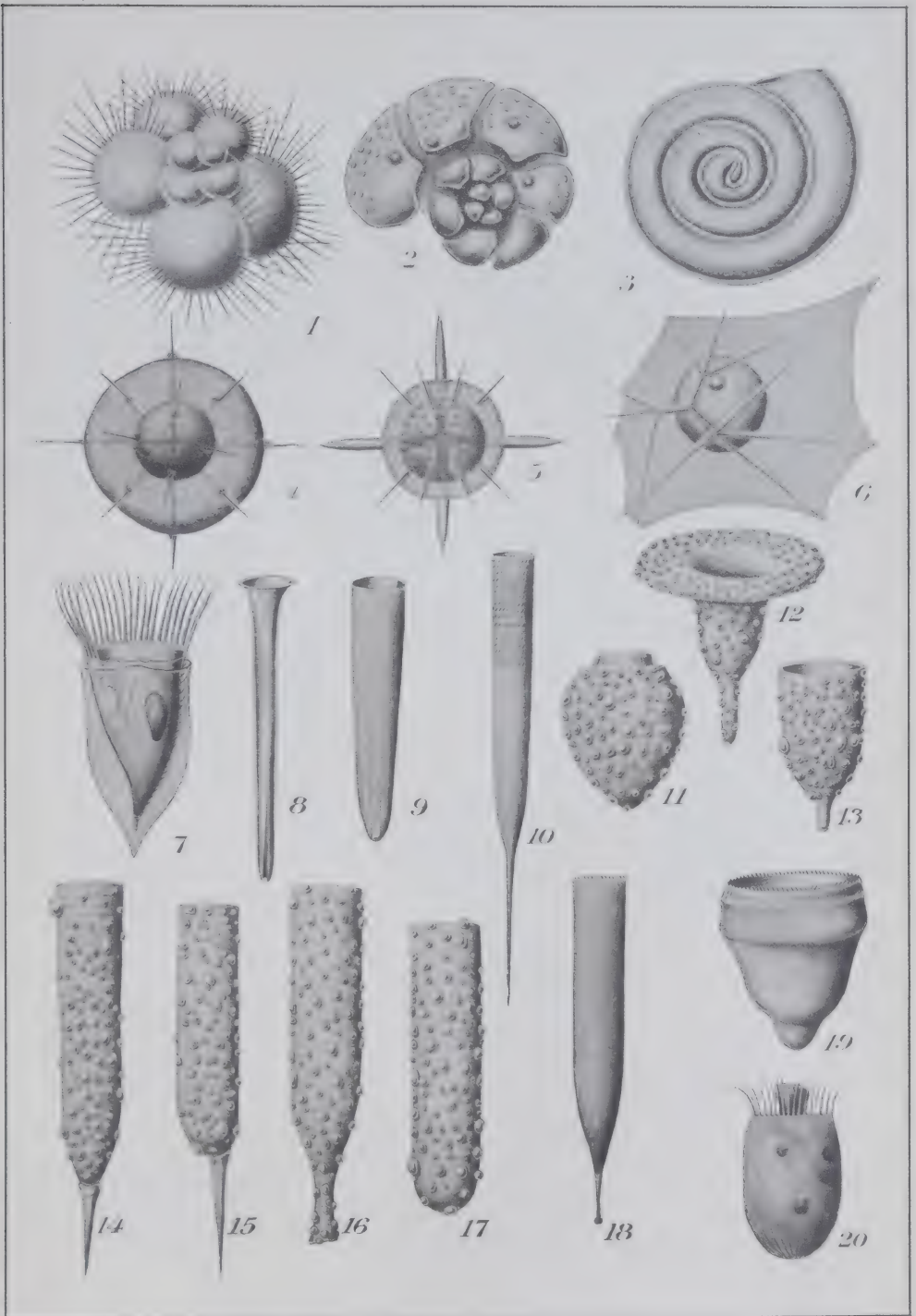
PLATE VII.

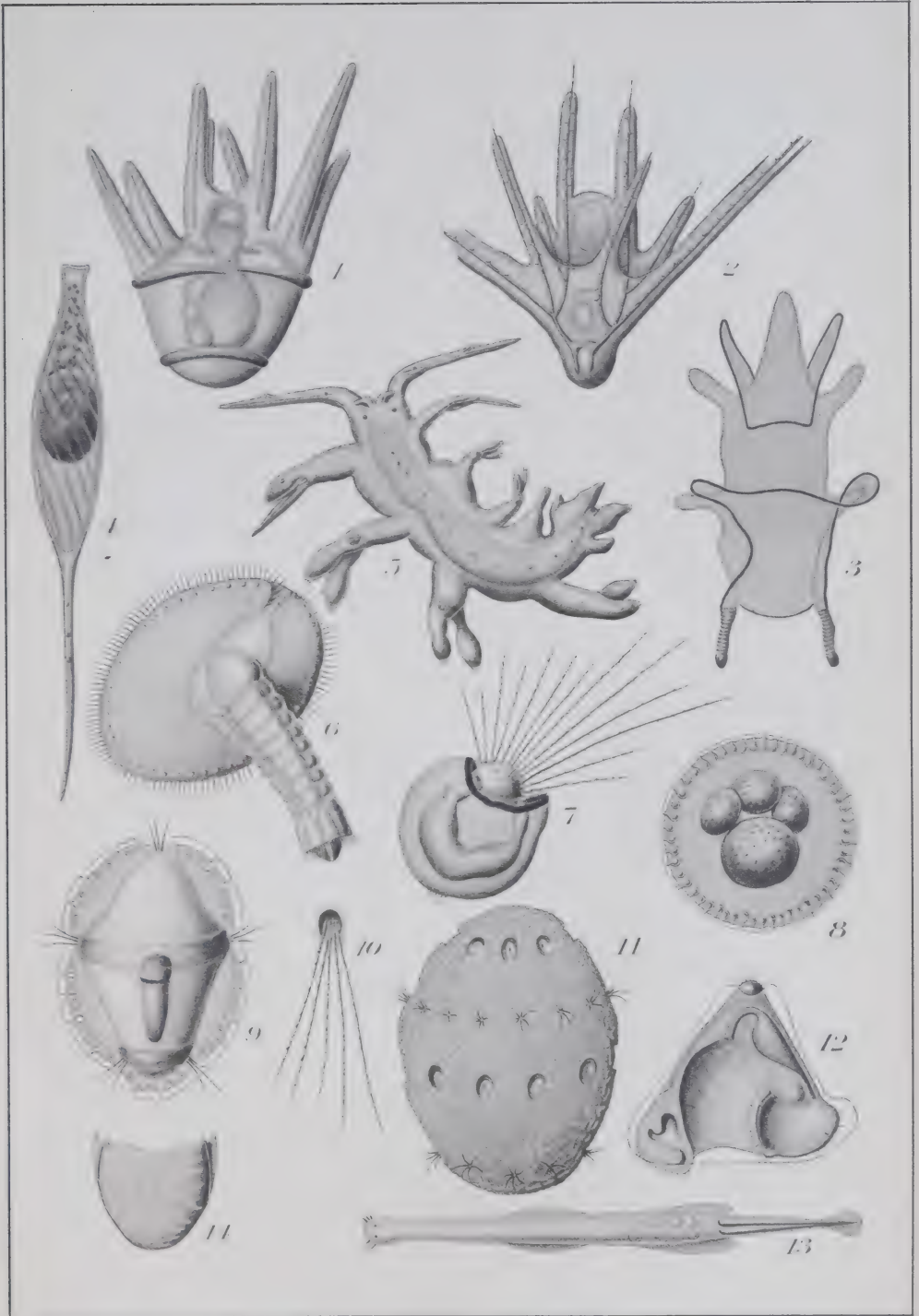
- FIG. 1. Undetermined pelagic gastropod egg.
2. Undetermined pelagic gastropod egg.
3. Contained larva with shell.
4. Undetermined pelagic egg.
5. Structure of flange of same.
6. Contained larva.
7. Larva of *Eolis despecta*.
8. Larva of *Clione aurantiaca*. $\times 30$.
9.)
10.) Larval shell of *Hyalaeaceæ*. $\times 150$.
11. *Fritillaria borealis*.
12. *Oikopleura dioica*.
13. *Oikopleura dioica*, the tail with subchordal cells.

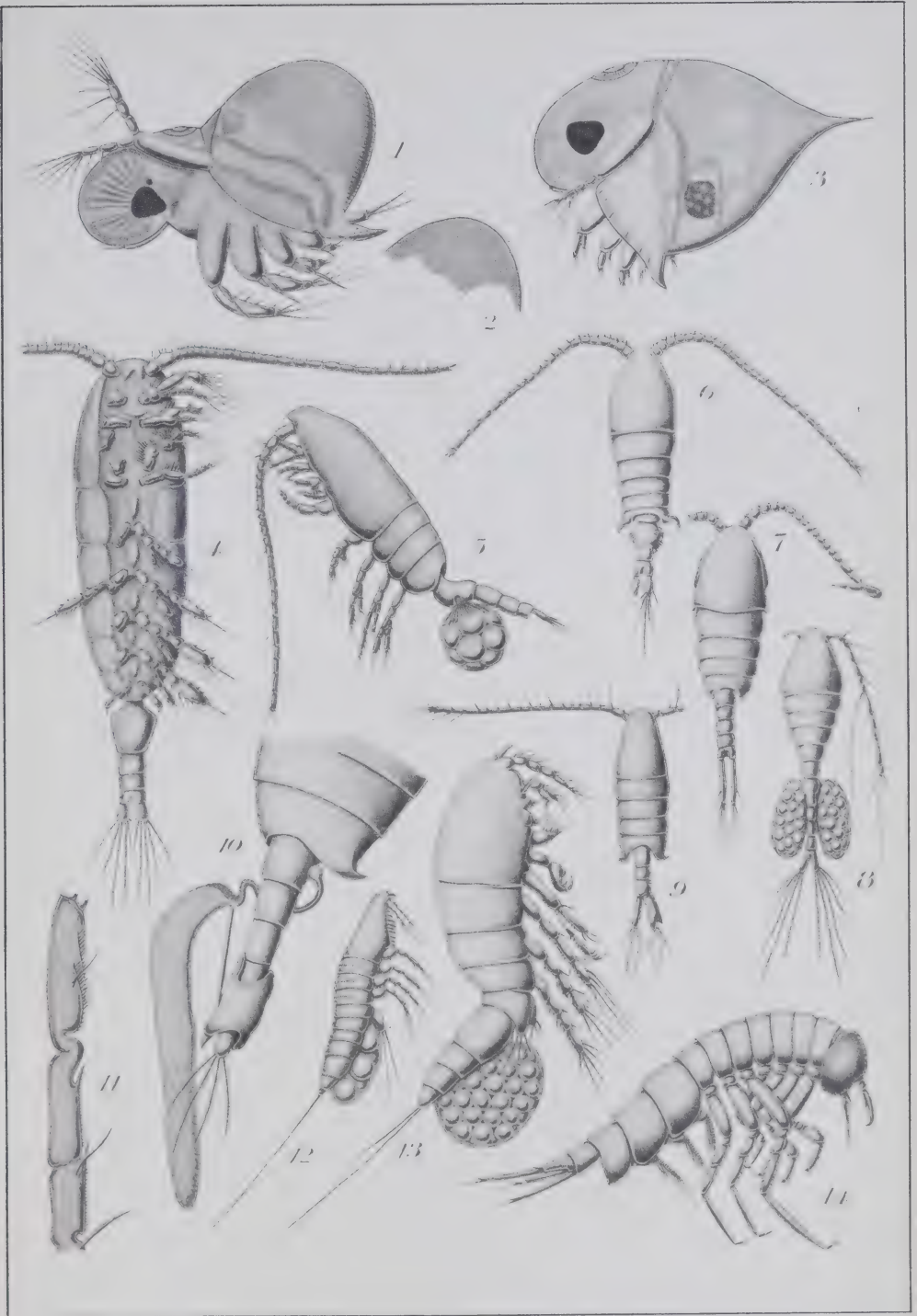


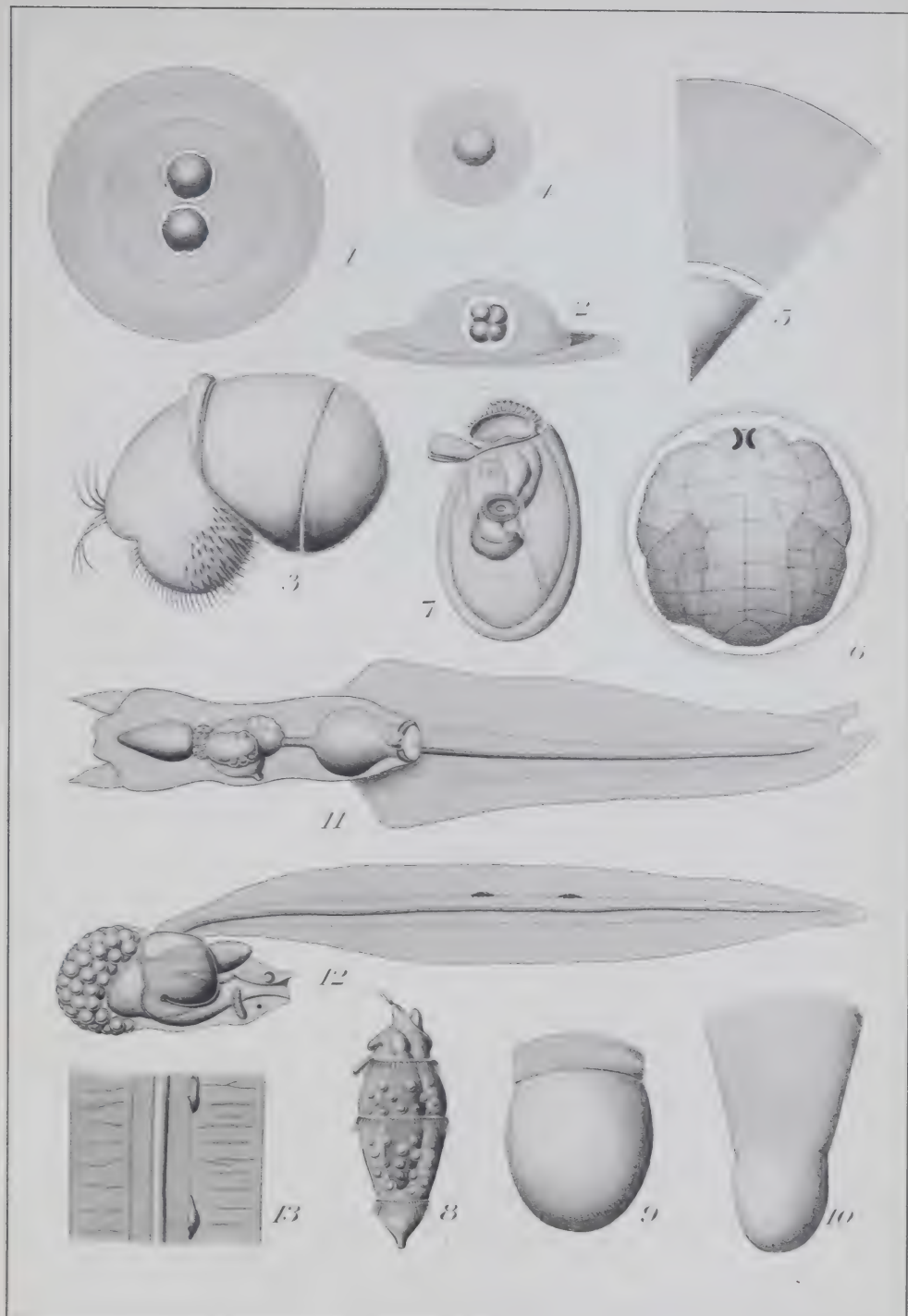












II

THE EFFECTS OF DYNAMITE EXPLOSIONS ON FISH LIFE.

A PRELIMINARY REPORT BY PROFESSOR A. P. KNIGHT, M.A., M.D.,
QUEEN'S UNIVERSITY, KINGSTON, ONT.

In issuing his announcement of the opening of the Dominion Biological Station for the season of 1901, the director, Professor Prince, suggested that some experiments should be undertaken 'on the wastefulness or otherwise of fishing with dynamite.' It was subsequently arranged that this should be my work for the summer, and the requisite permission to use dynamite having been obtained from the Ontario Fishery Department, Toronto, and from the Department of Marine and Fisheries, at Ottawa, experiments were begun the first week of July, 1901.

ACKNOWLEDGEMENTS.

Before beginning this report, I must acknowledge indebtedness to E. Abbot Johnson, Esq., L'Original, Ont., for hospitality and assistance, in carrying out experiments on the Ottawa river. Also, to my colleague, Dr. J. C. Connell, for the use of his launch in carrying on the experiments in Kingston harbour, and similar indebtedness to the Messrs. Whitman Bros., for extensive use of the tug 'Vulcan' off Canso harbour. It would have been impossible to carry out this investigation without the assistance given by these gentlemen.

DYNAMITE.

The dynamite used was the variety known as dualin and has the following composition:—

Nitroglycerine.	40 parts.
Fine sawdust or wood flour.	30 "
Potassium nitrate.	20 "

It is usually sold in cylindrical sticks, or cartridges, of two sizes, one being six, the other eight inches long, and about 1¼ inches in diameter. The cartridges are encased in oiled paper, and done up in five pound packages. Each package contains 6 small cartridges, and 14 large ones, and costs about \$2; that is, a little over 8 cents per cartridge for the small ones, and about 10 cents for the large. Fuse costs 75 cents per hundred feet, and caps or detonators about 75 cents per hundred.

The dynamite used at Canso was that manufactured by the Acadia Powder Company, Halifax; that used on Lake Ontario was obtained gratis from the Ontario Powder Company, at their head office, Kingston, and Mr. Smith, the general manager, kindly instructed me how to use the explosive, and furnished me with a copy of the pamphlet, which they send out to their customers. The following are extracts from it, so far as they have a bearing upon my work:—

INSTRUCTIONS.

'Dynamite, when properly used, is perfectly safe, but like all compounds of nitro-glycerine, must be handled with care and judgment. Although it will explode, if roasted up to a high temperature, it burns quietly if set fire to. In order to cause the explosion in practical use, therefore, it must be fired by means of an ordinary 'Detonator' with fuse, or by 'Electric Detonators' with a battery.

'For the former, cut off a piece of fuse to a proper length, straight across, shake all the sawdust out of the detonator, and push the fuse into it gently, nearly as far as it will go, and close the edges of the cap down on to the fuse. Then, if to be used under water, cover edges of cap with soap, grease, tar, or a similar substance, to keep charge inside of cap dry.

'Now, with a small punch, like a pointed lead-pencil, make a hole through the paper in the end of a cartridge of dynamite, as deep as the length of the detonator. If cap has been properly fastened to the fuse, the punched-in edges of the paper after cap is inserted will prevent its being pulled out, in lowering into the drill hole.

'CAUTIONS.

'Dynamite freezes at 42° Fahrenheit, and when frozen it is almost impossible to explode by cap, although it is more sensitive to rough handling. In cold weather, therefore, care should be taken to thaw it until it becomes soft. It is dangerous to do this before a fire. The proper method is to thaw the cartridge by means of a 'Thawing Box,' such as we make and sell at cost, or to keep them in a warm room for several hours before using, and to carry them to the work in a sack, wrapped up in a way to prevent chilling before using, as dynamite at the freezing point, is more sensitive to handling than at either a higher or lower temperature.'

All the explosions at the seaside, and half of these at Kingston, were made by means of a fuse and detonator. Some difficulty was at first experienced in producing explosions at depths greater than ten or fifteen fathoms, but by closing the detonators very firmly round the end of the fuse, covering the joint carefully with common soap, and sinking the detonator well into the dynamite, we succeeded in getting explosions in water as deep as 50 fathoms. When these precautions were not taken, the increased pressure at the greater depths forced water into the caps and prevented the fulminate of mercury from exploding. The difficulty in getting explosions along the Ottawa river was due to the fact that the fuse was not water tight.

In water from 18 to 25 feet deep, no sinker were attached to the cartridges; but in 30 to 50 fathoms, stones or old pieces of iron were used to sink the dynamite as quickly as possible.

LAKE ONTARIO EXPERIMENTS.

The first experiments were made in Kingston harbour, in water about 18 feet deep. Two cartridges were used, the detonation striking our boat like a huge sledge hammer. It stirred up a great deal of mud, and discoloured the water to a radius of 6 or 8 feet, gradually widening to 30 or 40 feet. At first we thought that no fish had been killed, but after waiting for about two minutes they began coming to the surface, and inside of 15 or 20 minutes, 130 perch and 1 small black bass had been lifted into the boat. About three dozen more were left floating; all were not dead; some appeared to be only stunned.

Post-mortem examination of a large number of these fish all showed similar effects: great capillary hæmorrhage from branches of the mesenteric arteries, congestion of the liver and spleen, and invariably rupture of the swim bladder. Portions of the intestines were usually forced dorsally into the cavity of the swim bladder, where, of course, there was also much blood. In rare cases, there was rupture of the venous sinuses feeding the auricles.

SESSIONAL PAPER No. 22a

VARIATIONS IN DESTRUCTIVENESS.

The first explosion and its results were typical of all the work done last summer. Of course the results were not constant, for obvious reasons. The destructiveness of the explosive varied according to easily recognizable conditions. It varied with (a) the charge of dynamite used, (b) with the depth of the water, (c) with the number of fish present in the neighbourhood of the explosion, (d) with their distance away, and (e) with the kind of fish.

That the destructiveness varies with the weight of dynamite exploded, needs no demonstration. This is probably true of all explosives. Many different charges were used, usually varying from one cartridge up to eight. The larger charges did not always result in bringing up the larger number of fish. The number killed depended more upon the number of fish in the neighbourhood than upon any other condition. For example, a charge of $1\frac{1}{2}$ lbs. exploded in the Kingston harbour, west of Garden Island, did not bring up a solitary fish, while one cartridge of $\frac{1}{4}$ lb. weight in St. John harbour, New Brunswick, killed over 800 fish.

The depth of the water was another important condition affecting the destructiveness of dynamite. Explosions were effected at depths varying from $1\frac{1}{2}$ to 300 feet. It produced little, if any, destruction of fish life at shallow depths, say, less than 10 to 12 feet. The reason of this probably is, that at slight depths, the pressure resulting from the explosion is not sufficiently great to rupture the swim bladder. One blast at 18 inches under the surface, sent up a column of water about 100 feet high; another blast about 3 feet below the surface sent up a narrow column about 60 or 70 feet high. In neither case were fish killed, though some must have been present. At 10 or 12 feet below the surface, the explosion lifted a broad cone or mound of water 6 or 8 feet high. At increasing depths, the surface disturbance became less and less marked, until at 45 fathoms or thereabouts, the only evidence of the explosion, after the noise and the tremendous blow on the bottom of the boat, was the appearance of a vast number of small bubbles of gas covering a diameter of from 40 to 60 feet. There was no upheaval of water. Evidently the large volume of gas generated at these depths is, on its way towards the surface, broken up into a large number of distinct bubbles, which separate as they ascend.

As regards explosions at increasing depths, a few of our results may be tabulated as follows:—

No. Expt.	Wt. of Dynamite. Lb.	Depth of Water, in feet.	Depth of Cartridge, in feet.	No. of Fish Killed.
1	$\frac{1}{8}$	12	12	0
2	$1\frac{1}{2}$	14	12	0
3	$\frac{1}{2}$	10	10	0
4	$\frac{1}{4}$	26	18	300
5	$\frac{1}{4}$	25	18	160
6	$\frac{3}{8}$	24	18	35

It is difficult to say whether in Nos. 1, 2, and 3 there were no fish present, or the pressure was insufficient to kill them. The probable explanation of the difference between the number killed in No. 4, as compared with those in No. 5, is that many more fish were present in the vicinity in the former case than in the latter.

No. 6 illustrates another variation in the effects of a dynamite explosion. In this instance not a single fish came up where the explosion occurred. About 30 yards away, seven or eight sunfish were killed outright—not a movement in one of them when picked up. A few moments later, a batch of perch and a few rock bass were seen coming to the surface about 60 yards away. Clearly, therefore, the number of fish killed varies directly with the number present, and varies also with their distance away from the site of the explosion.

Lastly the number killed depends upon the kinds of fish. Those with a thin, delicate texture of the swim bladder are more easily killed than fish possessing a thick,

tough membrane. Pollock were very easily killed for this reason; cunner, very difficult.

Stated mathematically, the energy of the exploding dynamite varies directly with the amount exploded, and diminishes with the distance away, according to an undetermined law, which probably depends upon the relative position of the exploding charge to the bounding water surfaces, upon the nature of the bottom, and possibly also upon conformation. So far as fish are concerned its effects upon them were found to vary (a) with the numbers near the site of explosion, (b) apparently with their depth beneath the surface, and (c) with the strength of their tissues, especially the walls of the swim bladder, and the sensitiveness of the nervous system, though this last was difficult to demonstrate.

CAUSE OF DEATH.

As already indicated, the immediate cause of death is rupture of the swim bladder, and internal haemorrhage. The rupture is evidently due to pressure. When an explosion occurs, there is a sudden liberation of gas tending to produce compression of the water at the site of the explosion. The wave of compression travels outwards in all directions—upwards, downwards and sideways. The direction of least resistance is, of course, always towards the surface of the water—hence the upheaval which follows an explosion. Quite frequently we found three other marked injuries, especially in large fish like pollock. Often in these the liver was compressed into fragments, the ribs were detached from the vertebrae along the whole length, and the flesh (temporal muscle) over the skull, after the skin had been cut, could be raised from the surface of the bone, leaving it as smooth and clean as a piece of polished ivory. Here again, the cause of the dislocation of these structures was pressure. The fish is veritably flattened between the compression wave of the explosion on the one side, and the unyielding water on the other; the ribs are torn from their attachments, the liver crushed to pieces and forced backwards into the extra-peritoneal cavity, and the flesh raised clean off the flat bones of the head. The surgeon sometimes meets with a similar experience in accidents due to crushing.

No external marks or injuries were visible on any of the fish, in either fresh or salt water.

SINKING FISH.

Very early in the investigation it became evident that besides those fish which came to the surface and floated, a number were merely stunned, and subsequently escaped, or were killed outright and sank to the bottom. This was important. The destructiveness of dynamite took on a wider aspect than that of merely counting the slain. The wounded and missing had, if possible, to be accounted for. If one could put off a blast in a large pond, count those killed at the surface, drain the pond dry, and then count the living and dead lying on the bottom, the investigation could soon be closed; but this was not the way in which the problem was presented. Accordingly other methods of investigation had to be planned. A simple method, and one likely to throw some light upon these points, was to use the water telescope. This was done in some of the narrow channels off Canso. Cunner abound in the shallow waters along these shores and between the islands, and after some expert knowledge had been gained by using, first a stove pipe and then an old eaves pipe for an aquatic telescope, we put off a blast, and counted our 'spoil.' Twenty-five dead floated belly up: that was one fact, or collection of facts, if you please. Then by the persevering use of our improvised telescope, one observer counted seven, and another of our party counted eleven dead cunner lying on the bottom. We recovered two of these. Post-mortem examination failed to show particularly why they had sunk. There was great visceral congestion, and profuse haemorrhage. In one, the swim bladder was much torn, while in the other, the rupture was so small that no air could be found escaping, except when the whole animal was

SESSIONAL PAPER No. 22a

placed under water and the swim bladder compressed. The smaller animals generally floated; the larger ones sank.

These results were, however, not satisfactory. In shallow water, explosions always stirred up the mud, and our crude telescope was useless. We determined, therefore, to make a tremendous 'slaughter of the innocents,' and with this end in view selected a small bay, nearly west of Grassy island, and there, set off the largest blast of dynamite which was used during the season—ten cartridges. The noise was loud enough to have awakened the spectral inhabitants of the old French island. There was a tremendous upheaval of water and mud, and in ten minutes wind and tide had spread the dirty water all over the little bay. Twenty-eight dead came to the surface. On returning next morning, we could find only three dead fish lying on the bottom, near where this explosion had occurred; that is, less than ten per cent had sunk in this experiment; in the previous one about thirty per cent.

The next attempt that was made to throw fresh light on this important point was in St. John harbour, New Brunswick. As a preliminary to the real test, a visit was made to one of the salmon weirs at low water. In one compartment of the weir were found two full-grown salmon, one 'fiddler' (small salmon), and ten or twelve adult gaspereau. The time was noon of August 10th. That evening, of course, there was a full tide, and next morning another, so that there were these two chances for additional fish to join their fellows in the weir. At 8.30 next morning, the weir was visited in company with the two fishermen who owned it, and one cartridge was exploded in the compartment which we had previously examined. The two salmon at once floated to the top, also six or eight gaspereau. But the deadly effect of the explosive was brought out in another, and rather unexpected way. Almost simultaneously with the occurrence of the explosion, an immense number of young gaspereau leaped from the water, and then fell back almost motionless upon the surface. They varied in size from $2\frac{1}{2}$ to 5 inches in length. They came partly from inside the weir, but chiefly outside the inclosure, stretching away up towards the city. Evidently a school of these young fish was making its way up into the harbour, or they were leaving it. We counted over 800 of them being driven away by the wind and tide, and estimated that as many of them sank as floated; but this was, of course, mere guess-work.

After rowing along the path of these floating fish for half an hour, we returned to the weir, and awaited the falling of the tide. The tide in this harbour goes out so far that the floors of many of the weirs are left almost dry. We had no difficulty, therefore, in determining the exact number of fish which sank. There they were, 27 gaspereau varying from 7 to 12 inches in length, lying dead on the bottom; 7 others somewhat larger on the average were swimming around in the scanty water remaining in the weir, and in company with these, 2 lively dog-fish which seemed to know perfectly well that they were in a trap. Here were the results which we had been looking for—8 or 10 killed and floating, 27 killed and sunk, and 9 alive. If the dynamite killed the young gaspereau in the same proportions outside the weir, as inside, then 2,500 of them lay dead at the bottom of the harbour in addition to the 800 which we had counted at the surface.

CAUSE OF FLOATING.

Nearly all the fish floated belly up; the sunfish lay more upon their side; lake trout on their back, but with the tail end deep in the water and head above it. Rupture of the swim bladder and escape of its gas ventrally so as to displace the centre of gravity, was probably the cause of the fish floating on their back. But a physiologist can scarcely escape the conviction that the nervous mechanism for the maintenance of equilibrium must have been paralyzed in all of them. Fish which die in water from other causes than concussion, say, from suffocation or from poison, lose their power of maintaining the vertical position, and in these cases they lie on their back because of muscular (i.e., nervous) inability to balance themselves.

WOULD IT PAY.

An attempt was made to see whether a large catch of fish could be obtained in the open sea by means of dynamite. The fishermen at Grand Manan were said to have made it pay during the summer of 1900, and better still in 1901. At any rate, a young seaman whose acquaintance I made through Mr. C. H. Whitman at Canso, claimed to have used dynamite at Grand Manan during June and most of July, 1901. He said that 'whereas only half a dozen vessels had used dynamite in 1900, there were about 90 using it in 1901. It was exceedingly effective with pollock, when they were plentiful and following the red shrimp. They used only one stick of dynamite and exploded it by a detonator and fuse two or three inches long. The men lighted the short fuse with a match or the burning tobacco of their pipes, and then threw the cartridge into the sea from the boat. They judged that the explosion took place about six feet below the surface, but could not say exactly to what depth the cartridge sank before exploding. Hundreds of pollock were killed by one explosion. He was of the opinion that from one-half to one-third of the fish sank and were lost. Other fish were killed besides the pollock. When the shrimps are all eaten up or disappear, the pollock begin feeding upon herring and squid, and consequently separate widely from each other. Under these circumstances, it was not found profitable round Grand Manan to continue the practice—too few being killed to pay for the dynamite and the men's time in collecting the scattered fish. Asked upon what grounds he had formed the opinion that from one-half to one-third sank, he answered that he had come to that conclusion on two grounds: first, by watching the fish sinking after an explosion; and secondly, because on one occasion at Digby inlet he had seen a blast put off beside the wharf in order to kill pollock. After the tide went out they counted as many dead fish on the bottom as they had collected at the surface.'

Such was the substance of the man's story. It remained for us to see how far our experience would confirm his. At the outset, let it be said that although there were six men on board the *Vulcan*, two being experienced fishermen, and all watching eagerly for results, it was generally agreed that it was impossible (by merely watching the surface) to form an opinion as to the number of fish that sank, as compared with the number which floated. We all saw one or two fish sink after some of the explosions, but not one of us from our own observations could confirm the young fisherman's opinion that one-half or one-third sank.

Our experience in St. John harbour compared with his in Digby inlet, showed that three times as many lay dead on the bottom, but they were not pollock.

As regards our experiments in the open sea, the following were typical:—

EXPERIMENT No. 1.

Dynamite, No. of sticks.	2
Depth of water, in fathoms.	7
Depth of dynamite down in water, fathoms	2
No. of fish killed.	20

One or two fish were observed to sink and not come to the surface again.

EXPERIMENT No. 2.

Dynamite, No. of sticks.	4
Depth of water, in fathoms.	7
Depth of dynamite down in water, fathoms.	2
No. of fish killed.	2

SESSIONAL PAPER No. 22a

EXPERIMENT No. 3.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	45
Depth of dynamite down in water, fathoms.. . . .	3
No. of fish killed.. . . . pollock	7

EXPERIMENT No. 4.

Dynamite, No. of sticks.. . . .	4
Depth of water, in fathoms.. . . .	45
Depth of dynamite down in water, fathoms.. . . .	3
No. of fish killed.. . . . pollock	1

In experiments 3 and 4 the pollock were schooling all around the boat, evidently chasing squid, which could easily be seen in the water. The eight fish taken in experiments 3 and 4 were all very large specimens. It was hoped that as the explosions took place among considerable numbers of fish, a large 'catch' would be obtained, but such was not the case.

EXPERIMENT No. 5.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	30
Depth of dynamite down in water, fathoms.. . . .	Unknown.
No. of fish killed.. . . . pollock	8

In this case the dynamite was simply dropped into the sea, but in most of the experiments it was lowered a fixed distance by line.

EXPERIMENT No. 6.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	30
Depth of dynamite down in water, fathoms.. . . .	30
No. of fish killed.. . . .	0

The dynamite was attached to a heavy piece of iron and the explosion took place at the bottom. There was no upheaval of water. The bubbles of gas, already alluded to, came to the surface very quietly, and had to be closely watched for, in order to be seen at all. This was characteristic of all the deep explosions.

EXPERIMENT No. 7.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	40
Depth of dynamite down in water, fathoms.. . . .	Unknown.
No. of fish killed.. . . . pollock	5

In this experiment it was at first supposed that no fish had been killed; but between fifteen and twenty minutes after the explosion, one fish was picked up; five minutes later a second fish; a few minutes afterwards three more fish. They all exhibited the same peculiarity, viz., that they made repeated and successful attempts to descend into the water, but, within a few seconds they were compelled to come again to the surface.

EXPERIMENT No. 8.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	30
Depth of dynamite down in water, fathoms.. . . .	30
No. of fish killed.. . . .	1

This fish came up fifteen or twenty minutes after the explosion.

EXPERIMENT No. 9.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	30
Depth of dynamite down in water, fathoms.. . . .	Unknown.
No. of fish killed.. . . .	2

EXPERIMENT No. 10.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	30
Depth of dynamite down in water, fathoms.. . . .	Unknown.
No. of fish killed.. . . .	0

EXPERIMENT No. 11.

Dynamite, No. of sticks.. . . .	2
Depth of water, in fathoms.. . . .	30
Depth of dynamite down in water, fathoms.. . . .	Unknown.
No. of fish killed.. . . .	0

In 9 the two pollock came to the surface ten or twelve minutes after the explosion.

Judging from our experience on the *Vulcan*, dynamite fishing cannot be made a commercial success out on the open sea. A few cunner were generally killed, but having no market value, were not counted in our results. We saw no young fish come to the surface during the whole day. Nor could it be said in our experience that pollock were frightened away. After the first day we were out on the bay, we heard that the owners of the small fishing boats were protesting against our operations, as likely to frighten away the fish from their usual haunts. But their fears were groundless, because two days afterwards the pollock were back again in greater numbers than before, and notwithstanding continued experiments on our part, the very best harvest of the season was reaped after our experiments had been concluded. Fishing folk, like other people, often cry before they are hurt.

LOBSTER EXPERIMENTS.

The young seaman already referred to, told a doleful tale of a poor lobster fisherman, who suffered a heavy loss through the explosion of a single stick of dynamite. The fisherman had saved up his catches of lobster by confining them in a pound, in anticipation of a rising market. The pound is a cubical box made of wooden slats, just close enough together to prevent the escape of the lobsters. The box is usually anchored out a short distance from shore, and as the water enters freely through the slats, the lobsters get enough aerated water to live on, if there are not too many of them, and if there is enough of a breeze blowing to create a current in the water. The young seaman's story is that when the lobster fisherman had accumulated about 500 animals in his pound, some mischievous or ignorant person put off a dynamite blast about 150 or 200 yards away, and killed every lobster. As he first told the tale, the lobster pound was 500 yards away, but on cross-examination he was compelled to reduce the distance.

SESSIONAL PAPER No. 22a

To test the accuracy of this story, six lobsters were obtained from a local fisherman. They were secured on the plea that the biologists required them for scientific purposes. The open season was over, and many of the lobster pots were lying high and dry along the shores, but on sailing out to the sand bar, or to Bass rock, it was easy to see that some of the fishermen were using lobster traps for 'scientific' purposes as well as ourselves.

The first experiment consisted in putting off a blast of 3 large sticks of dynamite at a distance of 80 feet from a trap containing 2 lobsters, and at a distance of 40 feet from a small lobster that was tethered by a piece of twine. The explosion produced no effect whatever upon any of the lobsters.

In the second experiment 2 large sticks of dynamite were exploded at a distance of 20 feet from the small lobster. The animal was uninjured so far as we could see.

The third experiment consisted in setting off two sticks of dynamite within 10 feet of a medium sized lobster. No result.

Finally, 3 sticks were exploded 15 feet away from a trap which contained 5 lobsters. These animals had all been used in the previous experiments. The explosion overturned the trap, nearly overturned one of the piles on which the wharf was built, but it seemed to have no effect upon the lobsters.

We concluded, therefore, that the 500 lobsters of the sailor's yarn had died—not from the effects of a dynamite explosion, but from suffocation. They had been confined in too small a pound for too great a time, and the explosion was co-incidental with the fisherman's discovery of their dying condition.

Further experiments are necessary to determine the effects upon lobsters at considerable depths, ours being at 12 to 15 feet.

ON THE OTTAWA RIVER.

Experiments on the Ottawa river were conducted at only one point, viz., about half a mile below L'Original village wharf. Twenty years ago, this point was considered a fine spot for pickerel, but to our amazement we obtained nothing but bullheads and suckers. The villagers and inhabitants generally claimed that the government dam at Carillon prevented the fish from coming up the river as they used to do, and that the better kinds of fish were decreasing in number.

EFFECTS ON MINUTE LIFE.

After several explosions in fresh water and one or two at sea, a small tow-net was drawn over the site of the explosions and the material collected was examined under the microscope the next day. Many living organisms such as copepods, phyllopods, &c., were found, and also dead ones, but it was impossible to determine whether the latter were dead when caught, or had died during the night.

Are fish eggs and larvæ killed by dynamite explosions? Because, if they are, this is one of the strongest objections that can be urged against the practice. Here again surface netting failed to show that the percentage of dead eggs or larvæ was increased to any appreciable extent. As is well known pelagic ova and fry both live near the surface of the sea, and it is difficult to understand how these, or any other tiny organisms could be killed by dynamite explosions any more than by the waves of a big storm. Of course, eggs which are laid on the bottom would certainly be destroyed, if they were near the site of any explosion, but further investigation is necessary on these points.

EFFECTS ON THE NERVOUS SYSTEM..

The brains of a dozen fish, half of them killed by dynamite, and half caught by hook and line, were preserved and subsequently examined under the microscope, Leitz

objectives 3 and 6, and ocular 3 being used. On comparison with each other no differences could be observed in their minute structure as a result of their different modes of death. One would expect that there should be differences, but none could be discovered by the methods which were employed.

KILLING OF SEAL.

An interesting result was obtained at St. John, N.B., at the instance of the fishermen. They often lose many salmon, through the depredations of sea-lions or seal. These animals regularly frequent weirs and kill numbers of the imprisoned fish. The fishermen naturally wished to know if seals could be killed by dynamite. Fortunately one of these animals happened to come up the harbour just as our other experiments were concluded. The men rowed out, and a blast of two cartridges was thrown towards the seal just as he dived, forty or fifty feet away. After disappearing under water he must have swam towards the impending explosion. When the tide went out, greatly to the delight of the fishermen, he was found dead sixty or seventy yards away. A deep hollow in the mud marked the site of the blast. Blood was oozing from the eyes, ears and nose of the animal. Evidently he had been killed by fracture of the skull.

CONCLUSIONS.

1. A serious result was clearly brought out in many of the experiments. Large numbers of immature fish were killed. Not one-third of those which came to the surface in fresh water could be sold in the market. Of course, immature fish are killed in other ways. Thousands of young fish perish in weirs all along our coast after every outgoing tide. Fishermen frequently leave them to rot upon the shore. The responsibility for this terrible destruction of immature fish rests in the first place upon the apathy and cupidity of the fishermen, and in the second place upon the Dominion government for allowing the slaughter to continue. Fishermen should be compelled to return immature fish to the sea, because so long as this destruction of young fish is permitted in netting, it is manifestly unfair and inconsistent to prohibit dynamite fishing on the score of its wasteful destruction of immature fish.

2. The second serious objection is the great waste due to the numbers which sink. It would be hardly fair to generalize upon the experiments at Canso and St. John. It is much safer to publish the facts, and the facts are that about one-third of the cunner sink, and that three gaspereau sink for every one that floats. As regards pollock, cod, salmon and other marketable fish, further investigation is necessary if a general conclusion is worth having.

3. Further investigation is necessary also to determine more accurately the effects upon the microscopic life of our inland and marine waters, for such microscopic life is a necessary part of the sustenance of the finny tribes.

KINGSTON, August 9, 1902.

III

ON THE FAUNA OF THE ATLANTIC COAST OF CANADA.

AN INTRODUCTORY REPORT

BY J. STAFFORD, M.A., PH.D.

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The establishment of a marine biological station for Canada offered an opportunity for a zoological survey of our eastern coast waters. Although the task must be a long and arduous one, yet enough has already been done to indicate some interesting features in the Atlantic marine fauna and to show the advisability of continuing its investigation. Before the establishment of the station, thanks to the enthusiasm of certain zoologists of Canada and of the United States, there had already been published a number of valuable lists of many classes of animals. But with the advantages of a portable laboratory, moving periodically and by successive stages along our coast, and equipped with the more necessary appliances, facilities have been furnished for a fuller systematic survey than was otherwise possible. The development of a marine laboratory must itself be gradual, and in the initial stages of its growth we can not look for the same thoroughness or comprehensiveness of results as in the later stages to which fall the legacies of a more complete outfit for collecting, and improved apparatus for experimenting, together with a more inclusive library and an experienced staff.

The biological station has been in existence since 1899; the first two seasons were spent at St. Andrews, New Brunswick, and the succeeding two at Canso, Nova Scotia.

In the summer of 1899, several weeks before the carpenters had completed the building at St. Andrews, a small but enthusiastic staff of workers commenced researches there. A row-boat or a hired sail-boat was alone available, and much time was lost in reaching the best grounds, indeed it was often out of all proportion to the real time of collecting; but there was the advantage of a rich faunistic district, offering many facilities for collecting from shore.

In 1900 there was built a 22-foot gasoline launch which gave only a few weeks' service and then had to undergo some change of fittings. A small steamer, the *Annie*, of St. Stephen, was hired for about the same length of time, in which longer trips were made. Altogether the work of the staff at St. Andrews occupied seven weeks of the first year, and fourteen weeks of the second.

In the spring of 1901 the laboratory was mounted on a scow, built at St. John, and was towed around the coast by the Dominion fishery cruiser *Curlew* to Canso N.S.. Here, through the liberality of the Messrs. Whitman, one or more of the staff had the advantage of being frequently taken to the local fishing banks on their steamer *Active*, whose crew also often brought back 'curios' captured by their trawl-hooks. On a few occasions also the same firm kindly gave the use of their tugboat *Vulcan*, and several men, with which to test the 12-foot beam trawl used for experiments.

Upon resuming work at Canso in 1902 the launch was put in order, and, while very useful for short distances, she proved not sufficiently speedy or even safe to venture out to deep water. As the station could not derive much benefit from the *Active*, herself and crew being employed for the greater part of our period of work by the wrecked *Blaamanden*, the staff was so far at a disadvantage. From a consideration of our means of locomotion up to the present, it seems worth while to mention that the first requirement of the station is a vessel large enough and sufficiently seaworthy to carry on work in deeper waters. This has been continually apparent at

Canso, where we could scarcely go any distance from home without being exposed to some danger in the open sea. The coast being bold and rocky yields little to the shore collector and, as a consequence, reliance had to be placed on netting and dredging. But these again we could only perform near shore and for the latter a rocky bottom is unproductive. Rarely has the dredge been used beyond fifty fathoms, and this for two reasons: first, because of our inability to go far out from shore, and second, because of the impossibility of hauling up the dredge by hand from a much greater depth.

Work was conducted at Canso 17 weeks in 1901 and 19 weeks in 1902—in the first of these years for a month before the arrival of the station, in the second, which was the longest term yet spent at the station, from May 1 to September 20. May and part of June were so cold and windy that it was unsafe to venture against the unmanageably rough seas. Hence time was profitably spent in collecting from shore, examining fish brought to the wharfs by steamers and schooners, or working over former collections made at the station.

With these brief references to the areas examined, the time spent in work each season and the means of visiting various localities it is appropriate to mention the methods of collecting. These of course differ according to the nature of the collecting ground and the kinds of animals sought. An excursion along the shore, especially after a storm, yields animals washed up on the beach, some of which, like sponges and jelly-fish, may have been brought long distances. An examination of the sea-weed may prove fruitful in crustacea, snails, worms and the like. With long rubber boots, a pail and a dip-net, one can wade in the water and look for ctenophores, shoals of shrimps and small fish. The turning over of stones between tide marks is most fruitful and reveals numerous species of worms, clams, &c., which may also be procured by digging with a spade into gravelly, sandy, or muddy ground in similar localities. About low-water mark is often to be found a different assemblage of animals, consisting of star-fish, brittle-stars, sea-urchins, sea-cucumbers, &c., and flat stones below the lowest tide-marks may shelter under them sponges, worms, molluscs, echinoderms, tunicates, &c., as well as the eggs and larvæ of many different species. Much can be learned by such procedure, and sometimes one may come upon rare specimens in the most unexpected positions.

With a boat the piles of wharfs, the timbers of piers, the stakes of brush-weirs, the sides of ships below the water-line, may be examined; old lobster pots and such objects, that may have lain for some time in the sea-water, may be hauled up and searched; and the shores of islands reached and investigated. On the way the water is scanned and the dip-net is kept to hand, a large net may be towed behind the boat, or small close-meshed nets may be towed along the surface or weighted to sink to different levels. These catch the small adult forms and larvæ that constitute the food of many fish, and some of the latter may be obtained by hook and line, while others may be secured in shallower water. To procure animals that live on the bottom a dredge, consisting of a quadrangular iron frame with a net attached at one side and a bale at the other, is dragged by a long rope let out behind the boat. The flat jaws of iron scrape off sponges, mollusca, echinoderms, &c., from the rocks which fall into the net behind, or collect shells and stones with hydroids, bryozoa and tunicates attached or mud containing worms and shells. Both the propulsion of the boat and the hauling of the dredge are best performed by machinery, but the smallness of the station's boats prohibits the use of a winch. Generally it has been found more productive to tow the boat. Propelled by sail or by the engine the speed is usually sufficient to raise the small dredges off the bottom, but often good catches have been made by simply allowing the boat to drift with the wind or in a surface current. The beam-trawl, already mentioned, consists of a strong beam 12 feet long supported on runners a couple of feet from the ground. Behind is attached a large long-pointed, coarse-meshed net of strong cord. The lower lip of this is strengthened by a rope weighted by small rods of lead, and hangs loosely on the ground into the depressions of which it falls. A rope bale is attached in front, and the whole is dragged by a long rope

SESSIONAL PAPER No. 22a

after a vessel under considerable headway. This covers a greater area than a dredge, and besides collecting many of the same kinds of animals it also picks up larger objects and captures fish—particularly flat fish.

We have hitherto considered only those animals that are to be found on the surface, or that live deeper in the sea, those that feed on the bottom, that burrow in the ocean-bed, or that creep over rocks or seaweeds. There are others that gnaw their way through and destroy the timbers of wharfs and ships, as well as those that creep over the surfaces of larger animals or fix themselves to definite parts of the skin or gills. One step further, and the collector may find animals that have penetrated into the bodies of others and have even become so completely reconciled to their new homes that they could not possibly continue to live if they were set free.

Live animals taken to the laboratory can usually be kept some time by occasionally changing the sea-water. Better results are reached by supplying the small glass aquaria with sea-weeds, gravel, &c. At Canso two coal-oil pumps were worked at the station so that both salt and fresh water were supplied to the laboratory tanks, and when necessary the aquaria could be thus continually replenished with fresh sea-water. In this way many animals, like sea-anemones, could be induced to expand their tentacles and give an opportunity for their study more conveniently than in their natural habitat.

The first location of the station at St. Andrews presented many special advantages. Its southerly sheltered situation implied, close at hand, a rich and varied fauna, while further out deep-water forms were also obtained, in Passamaquoddy bay and the entrance to the Bay of Fundy. Passamaquoddy bay, screened from the great Bay of Fundy by a chain of islands, is a body of water some 15 miles long by 7 broad. The tide rises and falls about 28 feet, making an enormous difference in the appearance of the shore and exerting a vast influence not only upon the habits of many marine animals, but even extending to the inhabitants of the coast. At many places the falling tide exposes this depth of nearly perpendicular rocks, in the crevices and fissures of which may be found numerous species of invertebrate animals. At other places the shore slants more or less gradually, leaving broad areas of rock, gravel, sand or mud, with animals adapted to every condition. Where the laboratory stood, on the east side of 'the point,' facing Malloch's weir, the lowest tides receded nearly 400 yards. With the rising tide strong currents are swept inwards, between the islands, carrying hosts of marine animals. When the tide falls again numbers of these are left stranded on the beach, or confined in small pools easily accessible to the collector. Approaching the large rivers that empty into the bay one finds other conditions, varying from saline through brackish to fresh water. Turn what way he will an observer is likely to come upon the common star-fish in many colour-varieties, the sea-urchin and the sea-cucumber, among echinoderms. The mollusca are abundantly represented by the edible mussel, the horse-mussel and the clam, long and round whelks, the purple shell, the periwinkle, and the limpet. Nereis, Arenicola, Nephtys, Rhynchobolus, Lepidonotus, Amphitrite, and Lineus are common representative of the worms; while crabs, hermit crabs, barnacles and sand-hoppers are the commonest types of crustacea. A good many hydroids, polyzoa, and sponges may also be easily procured along shore.

The best collecting places are reached at the period of lowest tides that occur only at the beginning and in the middle of each month. At such times one can wade into the water on the southwest side of the outermost limits of 'the point,' near St. Andrew's, and at arm's depth feel under the projecting ledges or turn over flat stones that are never left uncovered and are not accessible at other periods. This is probably the best place on the coast for sea-peaches (*Cynthia pyri formis*), but many other animals such as Nudibranchs and Sunstars (*Solaster*) occur. In fine sand at about half-tide mark just south of 'the bar' by Malloch's weir, I dug up the only specimens of *Balanoglossus* and of *Edwardsia* yet procured at the station. The north side and outer end of this bar are also good collecting places, where the sea-orange (*Psolus Fabricii*) may be picked by hand. The entrance to Katy's Cove

furnishes numerous forms, among which may be mentioned Chirodota, under the mussel beds to the left of the railway bridge; and farther inwards, around the remains of a former dam, are large-sized limpets and tube-worms. Craig's Ledges, on the upper side of the entrance to Chamcook harbour, are resorts rich in sea-anemones, brittle-stars, &c., as are also tide-pools near the outer, rocky end of Pendleton's island. In one of these, small enough to be jumped over and deep as one's waist, supported by a big rock on the side towards the water, and situated at about half-tide mark, during two successive summers, a great collection of animals appeared, comprising many species, among which may be mentioned a brachiopod (*Terebratulina*) which is usually procured only by dredging, and a tube-worm (*Amphitrite*). Nearby in fine sand occurs a species of *Enchytraeus*. The 'western block' on the bar between St. Andrew's and the island, and other places, were frequently visited and might be mentioned, but this must suffice.

The dredge was used in the St. Croix river above Dohet Island, between Joe's point and Robbin's Town, off all sides of St. Andrew's Island, up the bay towards the mouths of the Bocabec, Digdequash and Magaguadavic rivers, and once we went as far east as L'Etang and dredged scallops, landing on Frye's island at low water when returning. Opposite where the station stood we dredged at many places round the light-house (Sand Reef Light) and off McMaster's, Pendleton's and Deer islands. We also dredged off Pleasant point, and once went as far south as Eastport, Campobello island, and Lubec Narrows. This last is a rich and interesting region, and it is to be regretted that the staff were unable to examine it thoroughly as well as to visit Grand Manan.

The fisheries of economic importance at St. Andrew's are chiefly cod, haddock, pollock, herring, mackerel, and clams and lobsters.

At Canso the tidal water rises and falls only about 4 feet, affecting but a narrow belt of the shore. There are few accessible rich collecting spots, the coast being generally rocky with here and there small beaches of rounded stones, but seldom gravel, sand or mud. Wherever stones large enough for protection to animals and small enough to be moved by the collector do occur there is intolerably rough water producing friction fatal to delicate animal forms. At such places the stones, worn round and smooth by constant rolling and grinding, are heaped in enormous masses, while at other places they are laid out like pavement stones and solidly cemented into the beach.

At low water mark the star fishes and sea-urchins, which are a feature of the St. Andrew's region do not appear; these, however, may be found in limited numbers under wharfs or at places up the centre of Tickle channel; but sea-cucumbers, that at St. Andrew's may be found clinging to the ledges or arranged by the score in beds below the lowest tide limits, are scarcely ever seen at Canso; only two or three that were brought from deep water were secured. Sea anemones flourish under the wharfs and especially at French Point, where large brown, gray, yellow and orange Metridia occur side by side in the fissures of rocks. At this point too the horse-mussel and the edible mussel occur, but the latter may be obtained abundantly at the 'breakwater' (Grave Island). Clams are scarce, but may be found, together with a few razor shells (*Solen*), at Grassy Island and Publicover Beach. The large round whelk may be procured at Indian Cove, and the long whelk, together with the purple shell, the periwinkle, and little limpets, in small numbers at Glasgow Head. Various Nudibranchs live on the sea-weeds under certain wharfs, and fine specimens of *Eolis papillosa* under stones in the narrow channel between Piscatiqui and George Islands. Calcareous sponges, hydroids, and bryozoa occur on the submerged timbers of wharfs or on the sea-weeds to be found there or especially at Cranberry Islands. Arenicola, Nereis, Nephtys and other worms may be dug up from Llanigan Beach, where the laboratory stood, and in Grassy Island Cove and Publicover Beach. The sessile barnacle, the sand shrimp and the crab are the chief crustaceans, but lobsters, so plentiful in deep water among the islands, may be occasionally seen lurking under the edges of rocks along shore.

Dredgings were made at various places in Chedabucto Bay, e.g., at Crow Harbour, on Hydra Shoal, across the entrance to the Gut of Canso, and from that eastward be-

SESSIONAL PAPER No. 22a

tween Canso and Isle Madame as far as to Green Island. Near Canso, areas were dredged from Tickle Island to the eastward, encircling Derabie Islands and Cranberry Islands, to Cape Canso, and at many places in the harbours and between the islands.

Professor Prince, Professor Ramsay Wright, and others had the opportunity of being on the Mackay-Bennett cable-repairing steamer, and I had the advantage of remaining on board for a couple of days in Dover Bay and saw what animals were brought up on the cables as they were raised.

The most successful places dredged during the two seasons were to the north-east of Tickle Island and Durell Island, and outward from the bell-buoy in a line with the channel entering Canso Harbour from the west. Here occur calcareous and other sponges, a couple of species of sea-orange (*Psolus*), *Myriotrochus*, *Eupyrgus*, and one or two commoner Holothurians. Mussel shells dredged at the entrance to Grassy Island Cove have *Crepidulas* attached.

Although Canso is not a point exceptionally favourable from which to collect invertebrates in numbers, yet, in one way or another, specimens were procured of most of the species obtained at St. Andrew's, besides a few others. Its proximity to some of the best fishing banks in the world is sufficient proof that there exist somewhere in the adjacent waters vast quantities of smaller animals upon which the fishes feed. The most valuable of these fisheries, as is well known, are the cod, haddock, pollock, mackerel, salmon, halibut, the lobster, and the squid.

As the member of the staff charged largely with the collection of specimens and their storage for purposes of study, &c., a vast amount of the material obtained since the station was founded has passed through my hands. In spite of an inadequate supply of literature necessary for accurate determination of species, I have been able to prepare a list, which when finally revised will be a basis for future work. I shall give here a list of the Porifera, the Coelenterata with the exception of the smaller hydroids, and the Echinodermata, and propose in further papers to add to the present contribution, after the specimens have been more completely worked over, and others collected from more northerly areas.

PORIFERA.

Ascartis fragilis, Haeckel—St. Andrew's, Canso.

Leucosolenia cancellata, Verrill—St. Andrew's Canso.

Sycon protectum, Lambe—Canso.

Leucandra cyathus, Verrill—Canso.

Amphoriscus Thompsoni, Lambe—Canso.

Polymastia robusta, Bowerbank—St. Andrew's.

Suberites suberea, Johnston—Canso.

Halichondria panicea Johnston—St. Andrew's, Canso.

Reniera aquaeductus, O. Schmidt—Canso.

Eumastia sitiens, O. Schmidt—St. Andrew's.

Chalina oculata (Pallas), Bowerbank—St. Andrew's, Canso.

Chalina Sp.—Canso.

Pachychalina, Sp.—St. Andrew's.

Myxilla Behringensis, Lambe—St. Andrew's, Canso.

Desmacidon palmata, Johnston—Canso.

Esperella lingua, Bowerbank—St. Andrew's, Canso.

Esperella modesta, Lambe—Canso.

Plakellia ventilabrum, Johnston—Canso.

————— (on brachiopods)---St. Andrew's, Canso---Sponge, genus and species undetermined.

————— (Tall, rough cylinders, on rocks)---Canso---Sponge, genus and species undetermined.

Halisarca Dujardinii, Johnston—Canso.

COELENTERATA.

- Ptychogena lactea*, A. Agassiz (medusa)—St. Andrew's.
Tiaropsis diademata, A. Agassiz (medusa)—St. Andrew's.
Tima formosa, L. Agassiz (medusa)—Canso.
Polycanna Grænlandica, Peron et. Lesueur (medusa)—Canso.
Physalia pelagica, Lamarck—Canso.
Cyanea arctica, Peron et Lesueur—St. Andrew's, Canso.
Aurelia flavidula, Peron et Lesueur—St. Andrew's, Canso.
Alcyonium rubiforme, Ehrenberg—Canso.
Alcyonium carneum, L. Agassiz—Canso.
Alcyonium Sp. (big, lilac-like)—Canso.
Epizoanthus incrustatus, Duben and Koren—Canso.
Edwardsia sipunculoides, Stimpson—St. Andrew's.
Metridium dianthus, Ellis—St. Andrew's, Canso.
Chondractinia nodosa, Fabricius—Canso.
Actinauge Verillii, McMurrich—Canso.
Stomphia carneola, Stimpson—St. Andrew's, Canso.
Actinostola callosa, Verrill—Canso.
Bolocera Tuediæ, Johnston—Canso.
Pleurobrachia rhododactyla, L. Agassiz—St. Andrew's, Canso.
Bolina alata L. Agassiz—St. Andrew's, Canso.
Idyia roseola, L. Agassiz—St. Andrew's, Canso.

ECHINODERMATA.

- Cucumaria frondosa*, Gunnerus—St. Andrew's, Canso.
Cucumaria calcigera, Stimpson—Canso.
Cucumaria minuta, Fabricius—St. Andrew's, Canso.
Psolus Fabricii, Duben and Koren—St. Andrew's, Canso.
Psolus phantapus, Linnæus—Canso.
Thyonidium productum, Ayers—Canso.
Chirodota ferruginea, Verrill—St. Andrew's.
Myriotrochus Rinkii, Steenstrup—Canso.
Eupyrgus scaber, Lutke—Canso.
Trochostoma ooliticum, Pourtales—Canso.
Asterias vulgaris, Stimpson—St. Andrew's, Canso.
Asterias polaris, Muller & Troschel—Canso.
Solaster endeca, Retzius—St. Andrew's, Canso.
Solaster Syrtensis, Verrill—Canso.
Crossaster papposus, Fabricius—St. Andrew's, Canso.
Ctenodiscus crispatus, Retzius—St. Andrew's, Canso.
Pteraster militaris, Müller—St. Andrew's, Canso.
Cribrella sanguinolenta, Müller—St. Andrew's, Canso.
Ophioglypha Sarsii, Lütken—St. Andrew's, Canso.
Ophioglypha robusta, Ayres—St. Andrew's, Canso.
Ophioglypha nodosa, Lütken—Canso.
Amphipholis elegans, Leach—St. Andrew's, Canso.
Ophiopholis aculeata, Linnæus—St. Andrew's, Canso.
Ophiacantha bidentata, Retzius—St. Andrew's, Canso.
Gorgonocephalus Agassizii, Stimpson—St. Andrew's, Canso.
Strongylocentrotus Drobachiensis, Müller—St. Andrew's, Canso.
Echinarachnius parma, Lamarck—St. Andrew's, Canso.

IV.

A FURTHER REPORT UPON THE EFFECTS OF SAWDUST ON FISH LIFE.

By PROFESSOR A. P. KNIGHT, M.A., M.D., &C., QUEEN'S UNIVERSITY, KINGSTON.

The following investigation was begun in the year 1900, at the suggestion of Professor Prince, the fish commissioner for the Dominion of Canada. In the previous year Professor Prince had summarized in a most admirable way the effects of different kinds of pollutions upon fish; and, in order to do this, had consulted a great mass of scientific literature emanating from investigators in both Europe and America. One of the things which struck him as most remarkable was 'the painful lack of scientific demonstrated knowledge as regards the effects of sawdust upon fish life.' The onerous and exacting duties of his office precluded him from undertaking any lengthened series of scientific experiments himself. But from the very start of research work at the Dominion Biological Station he impressed upon the workers the importance of certain fisheries problems which he desired to have solved. Among these was the sawdust question.

Up to 1899, when Professor Prince wrote the report alluded to above, he had ample opportunities, during the course of his official visits to different parts of Canada, of making observations upon sawdust-polluted streams, and as a result of these observations he reached the conclusion that, 'so far as our present knowledge goes, sawdust pollution, if it does not affect the upper waters, the shallow spawning grounds, appears to do little harm to the adult fish in their passage up from the sea. . . . There is no case on record of salmon, or shad, or any other healthy adult fish being found choked with sawdust, or in any way fatally injured by the floating particles.'

The Dominion law was, however, against Professor Prince's views on the matter, and in 1901, the Ontario Fisheries Department proceeded to enforce the Dominion Act. Three mill-owners were fined for passing sawdust and shavings into streams containing protected fish, and many others were warned.

The Deputy Fish Commissioner for Ontario, Mr. S. T. Bastedo, held views the very opposite of these expressed by Professor Prince. In his annual report for 1899, Mr. Bastedo says: 'There can be nothing more destructive of fish life than the depositing of sawdust in the rivers and lakes.'

When two experts hold views so diametrically opposed as those of Professor Prince and Mr. Bastedo, the average member of parliament may well be excused from holding any views at all upon the subject; and yet he is forced to take some stand on the subject of prohibitive legislation? There has been a law against throwing mill refuse into the rivers of Canada ever since 1860. Certain streams were exempted from the operation of that law right down to 1899. The practical question, therefore, now facing the fish commissioners in the various provinces is this: 'Shall the law be enforced?'

Evidently the whole subject should be reported upon by disinterested investigators, and the law should be neither repealed nor enforced until their judgment is received.

The literature of the subject helps us very little. Previously to 1888 there were frequent references to it in the annual reports and bulletins of the United States Fish Commission; but the experts were by no means unanimous in their judgments, as is evident from the following editorial published in *Forest and Stream* in 1899:—

'The effect of sawdust in lakes and streams has been discussed by many writers and with conflicting opinions.

In the second part of the Report of the United States Commissioner of Fish and Fisheries, 1872-73, Mr. James W. Milner gives the result of his observations on the great lakes. Speaking of Green bay, he says that whitefish were formerly taken in abundance in the spawning season in a number of rivers emptying into this bay; but sawmills are numerous at present on all of these streams, and the great amount of sawdust in the rivers has caused the whitefish to leave them. The effect of the sawdust, he states, is to cover up the spawning grounds and destroy the food of the fish. Watson, in the third part of the same report, charges the sawdust with the destruction of the purity and aerated condition of the water, so changing its character as to revolt the cleanly habits of the salmon. He mentions the experience of Mr. Arnold, who had seen the gills of salmon filled with sawdust. Mr. Mather, in Transactions American Fishcultural Association, 1882, and in these columns of the same year, thinks that sawdust is destructive to the young by covering up the spawning grounds, and by polluting the water with turpentine from the pine and tannin from oak.

Mr. J. J. Brown, of Ludington, Mich., in Bulletin V., United States Fish Commission, charges the sawdust and shingle shavings dumped into Lake Michigan with the annihilation of the feeding grounds of fish. The statements of 'Sportsman' and Livingston Stone in recent numbers of this paper, are very positive as to the deleterious influence of sawdust in polluting the water, killing the young and promoting the growth of fungus. Mr. Stone believes that after the spawning grounds are covered with sawdust the stream can produce no more trout.

Charles G. Atkins, in Part II., Report of United States Fish Commission, speaks of the Penobscot river. He finds that sawdust has interfered with the success of certain fishing stations, but the salmon are not prevented from ascending to their spawning beds, which are free from obstruction and seem to suffer no injury from the refuse.

Professor H. Rasch, an eminent authority in Norway, communicated his views on the sawdust question to the Norwegian Hunting and Fishing Association in 1873. He admits that rivers on which there is considerable cutting of timber gradually become more and more destitute of salmon, but thinks that the injury is not to the fish directly, but is caused by limiting and partially destroying the spawning grounds. He cites the River Drammen, which was greatly polluted by sawdust for many years, and in which the salmon decreased constantly, until the fishermen at Hellefos begun hatching them artificially and planting the fry annually. Having access to the upper part of the river, which was comparatively free from sawdust, the ascending fish seemed to be little affected by the mill refuse from below Hellefos. His opinion, based upon experience on the Drammen river and the Soli, was that unless the salmon are prevented by impassible dams from ascending above the mill locations, the sawdust will not drive them from the streams nor materially injure them. *Piscator*, Charles Hallock, and Milton D. Peirce have produced statistics and observations to prove that sawdust in streams of Nova Scotia and Massachusetts has not injured the fishing for trout, and has not unfavourably affected any of the river fisheries.

From the foregoing survey it will be evident that there are two sides to the question as to the influence of sawdust in streams and lakes, and it may be possible that some of the states which have legislated against the deposit of this substance in certain waters have placed unnecessary restrictions upon an important industry. Unless spawning grounds are actually covered and feeding grounds destroyed, there would seem to be no case against the sawdust. At all events, the instigators of this legislation should produce evidence of deleterious effects to be remedied by legal enactments, and show that such pollution is necessarily and always fatal, and cannot be mitigated by measures to aid the ascent to the spawning beds.'

Since 1889 the references to sawdust are 'few and far between,' and when its poisonous effects are asserted, the responsibility for the statements is placed upon fishermen or fish dealers. Even the international commissioners of 1893 made no

SESSIONAL PAPER No. 22a

dogmatic statements of their own, but simply submitted the statements of witnesses whom they had examined.

The experimental part of my work was begun at the Dominion Biological station, St. Andrews, N.B., in 1900, and has been continued since then in the biological laboratory of Queen's University, Kingston, Ontario. The river work consisted of a few weeks' study of the Bonnechere, a tributary of the Ottawa.

Those who are interested in the details of my experimental work are referred to the Transactions of the Canadian Institute, Vol. VII., 1903, under the article 'Sawdust and Fish Life.'

SINKING OF SAWDUST.

Numerous observations were made upon the sinking of sawdust. The general method of experimentation was to add known volumes of sawdust from different kinds of wood to separate vessels containing a measured volume of water. The sawdust was generally dropped quietly upon the top of the water. As a rule, the particles of sawdust began to sink the moment the sawdust touched the water. This was particularly true if the particles were fine; but there were considerable variations in the rapidity with which sinking occurred. So far as could be determined by laboratory experiments, the rate of sinking varied with (*a*) the size of the dust particles, (*b*) the way in which they were made, (*c*) the motion of the water, (*d*) the dryness of the dust, and (*e*) the kind of wood.

Large particles sink more slowly than small ones, because the latter are more easily penetrated by the water.

Large saws which strike logs with great force (as in a sawmill) compress the wood, drive out the air imprisoned in the cells, and produce sawdust that sinks quickly.

Sawdust sinks slowly in perfectly calm water, such as a standing vessel. If the vessel be tapped gently on the side, the sawdust sinks much more quickly.

If thrown into rapidly flowing stream, sawdust is carried downwards until it reaches pools, eddies, or comparatively calm stretches; it then sinks and forms sawdust beds. Some of these are of great extent along the Ottawa river.

Sawdust from different kinds of wood arranged themselves in the following order as regards rate of sinking.—

1. Oak.
2. White pine, 50 to 80 per cent of it in 2 or 3 minutes.
3. Maple.
4. Cedar.
5. Elm.

But it must be remembered that the particles in my experiments differed from each other in size and in the moisture they contained, and consequently different results might easily be obtained by other observers. The important point is that all kinds of sawdust sank in a few minutes in agitated water.

EXTRACTS FROM SAWDUST.

When sawdust was placed in a clean bag, and the bag sunk to the bottom of an aquarium by means of stones, there oozed out of the sawdust a yellowish, brown liquid which lay along the bottom of the vessel. (See fig. 1). In a number of experiments this brownish water occupied $1\frac{3}{4}$ inches at the bottom of an aquarium containing water to a depth of $16\frac{1}{2}$ inches. The overlying water remained clear and colourless for several days when pine sawdust was used. In the case of cedar, the aqueous extract diffused upwards into the clear water, but never rendered it so dark as that which lay at the bottom. When the brown water was siphoned out, the sawdust soon discoloured more of the clear water. Evidently the water was dissolving out from the

6-7 EDWARD VII., A. 1907

sawdust some soluble material which was stored in the wood. This yellowish brown solution was found to be exceedingly poisonous to fish eggs, fry, living organisms suitable for fish-food and adult fish.

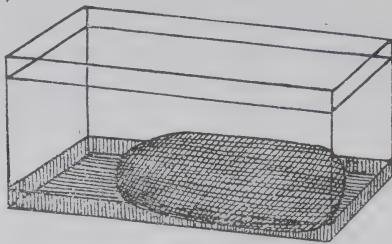


Fig. 1.

SOURCE OF POISON.

In order to understand the source of this poison we must try to get a clear idea of the minute structure of trees. This can be done only by the aid of the microscope. With this instrument, it is easy to see that all parts of young plants are made up of a vast number of very small bladder-like compartments called cells. In older plants and trees, these cells lengthen out and are then called vessels. It is important to note that every cell or vessel consists of two principal parts, (a) the outside covering or cell wall, and (b) the inside matter or cell contents. If one were to imagine the cells in the comb of a honey bee shrinking into such a small size that each one would be almost invisible, then a very good idea would be obtained of the minute structure of a tree. The wax would correspond to the walls of the cells composing a tree, and the inclosed honey would correspond to the cell contents.

In aquatic plants, like pond silk, the cells are cylindrical and placed end to end, so as to form the long slender threads. In flat leaves, the cells are arranged side by side in two or more layers, so as to form the flat surface; in stems they are packed side by side and end to end. Thus, trunk, branches, bark, roots, flowers and fruit are all made up of these cells. In different plants they differ vastly in shape, size, thickness of walls and contents. Bacteria are plants consisting of single cells; pines are composed of millions of cells. In all plants also, the protoplasm, which is the central, living, moving, sensitive part of the cell, manufactures different substances, and either packs these in the cell as reserve material, which is the case in the higher plants, or throws them out of the cell altogether as dead waste, which is the case in many of the bacteria.

In order, therefore, to find out more definitely, if possible, the source of the poisons given off by sawdust, we must look more closely at the contents of wood cells.

CELL CONTENTS.

Young cells are filled at first with protoplasm only. As time goes on, sap forms in the cell and accumulates as small drops in the protoplasm. The sap consists of water and nutritive material dissolved in the water. These two stages in cell life are represented in Figures 2 and 3. Somewhat later, other substances which have been formed by the activity of the protoplasm are stored in the cell, along with the protoplasm and cell sap. Among the commonest materials thus stored in cells are sugar, starch, oils, such as olive, castor, linseed and palm oil; resins, gums, jellies, alkaloids, pigments, acids, such as malic, citric, tartaric and tannic, essential oils such as turpentine.

In the pine family there is stored in the wood and bark cells an abundance of crude turpentine and resin. The Norway spruce of Europe furnishes, from cells, turpentine and Burgundy pitch. The yellow pine of the southern United States yields

SESSIONAL PAPER No. 22a

spirits of turpentine by distillation of the crude turpentine which runs away from the trees when they are tapped. The residue after the distillation is known as resin.

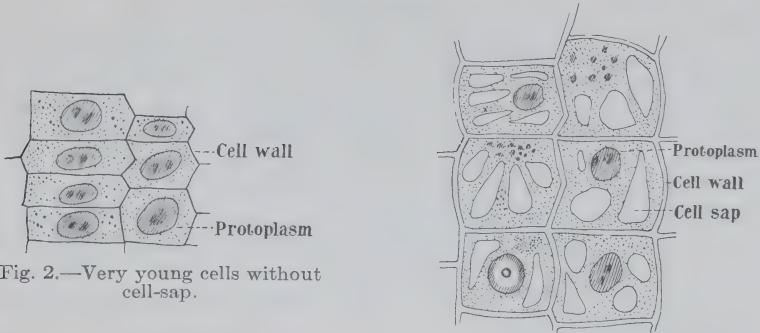


Fig. 2.—Very young cells without cell-sap.

Fig. 3.—Cells showing cell-wall; protoplasmic contents with cell-sap.

Now the source of the poison in the yellowish brown water is unquestionably the material stored in the wood cells. As each cell or vessel is microscopic and contains only a very small quantity of poisonous material, and as the cell wall must be broken open in order to let out the cell contents, it follows that the greater the number of cells that are opened, the greater will be the quantity of turpentine, tanin, &c., poured out. Hence a saw-log completely converted into sawdust would give out the maximum of poison, whereas a similar log sawn into boards, slabs and edgings would give out a much less quantity. Pulp mills will give out the maximum of stored material. So will beet-sugar factories.

The total waste in manufacturing saw-logs into inch boards varies from 25 per cent to 35 per cent of the whole log. Of this total waste, about 13 per cent is sawdust. The proportion of refuse varies (1) with the size of the logs, (2) with the kind of lumber into which the logs are sawn, and (3) with the width of the cut made by the saw.

PULP MILL POISON.

My St. Andrew's experiments determined the percentage of poison from a sulphite pulp mill which is fatal to fish life, but so far as I know, the percentage of poison from a mechanical mill has never been determined. A provisional conclusion, however, may be fairly based upon some of my experiments to be described later in this paper.

QUANTITATIVE DETERMINATIONS.

A quantitative determination of the solid matter contained in the yellowish brown water was made by evaporating 1,000 c.c. of it, at 100° C., in a platinum crucible, and then weighing the rest.

The following results were obtained from white pine solution:—

	M.gs.
1. Solid matter from 1000 c.c. water, the sawdust soaking for four days.	1160
2. Same sawdust with the first water filtered off, and fresh water added and allowed to stand for five days. Solid..	260

CEDAR SAWDUST.

1. Solid matter from 1000 c.c. water, the cedar sawdust soaking for four days.	1220
2. Same sawdust with first water filtered off, fresh water added and allowed to stand five days.	470
3. Same operation repeated. Soaking five days	270

These determinations indicate clearly enough that the stored material in wood cells comes away in diminishing quantity every time fresh water is added to sawdust.

WHITE PINE.

A long series of experiments were made with water obtained by soaking 360 grams of white pine sawdust in 7000 c.c. of tap water and changing the water at irregular intervals. During a period of three weeks the water was changed twenty times. In 1,000 c.c. of the twentieth solution, there was found to be 80 m.gs. of solid matter dissolved out of the pine cells. During every day almost of the three weeks, the effects of the poisonous water were tested by immersing fish eggs, adult perch, aquatic worms, tadpoles, copepods, daphnia, hydra, vorticella and black bass fry in the water, and in every instance death followed sooner or later. Sometimes death took place in a few minutes, sometimes in a few hours, the result depending upon the strength of the solution. When air was made to bubble through the poisoned water, the animal lived somewhat longer.

CEDAR SAWDUST.

A similar series of experiments were carried out with cedar sawdust. In this case, 400 grams of sawdust were soaked in 7000 c.c. of tap water. The water was changed 30 times during a period of five weeks, and a 1000 c.c. of the last solution of it—were found to contain 155 m.gs. of solid matter. The water was tested almost daily by immersing animals in it, just as in the case of pine extracts. The cedar water was found to maintain its poisonous character for a longer time than pine. In other words, cedar wood cells contain more poisonous matter than pine wood cells.

EXTRACTS QUICKLY SOLUBLE.

The experiments hitherto described would seem to indicate that some considerable time was required for the water to dissolve out the poisonous extracts from white pine sawdust, but such is certainly not the case. This was clearly shown in the following experiment, Fig. 4. Two minnows were confined in a bottle containing 600 c.c. water and eighteen grams of white pine sawdust. Fresh water was made to enter and leave at the rate of 100 c.c. per minute. The inlet tube passed straight to the bottom of the vessel, and its lower end was therefore buried in about an inch of sawdust. One animal lived forty minutes, the other fifty. When the incoming water was reduced to 80 c.c. per minute three minnows lived only from three to five minutes. When the fresh water entered at the rate of 125 c.c. per minute, minnows lived from twenty to ninety minutes. The control animals were kept for a week in a similar bottle, without sawdust, of course, and with water coming in at the rate of 110 c.c. per minute. In these experiments the poisonous extracts must have been coming away all the time. The moment the bottle was full of water the minnows were slipped into it. Consequently, when the fish were killed in five minutes, the 600 c.c. at first in the bottle, and 400 c.c. additional water were poisoned. When they were killed in ninety minutes, no less than 11,250 c.c. were poisoned. That is, the percentage weight of sawdust to poisoned water was .16 per cent. This determination is important, as we shall see later, when we come to compare it with the percentage of sawdust thrown into the Bonnechere river.



Fig. 4.

COMPARATIVE RESULTS.

After obtaining the general results indicated in the preceding part of this paper, it seemed desirable to plan a series of experiments that would show comparative results

SESSIONAL PAPER No. 22a

at a glance. With this end in view, two grams each of different kinds of sawdust were placed in shallow circular dishes containing respectively, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,200, 1,500 and 1,700 c.c. of fresh water. After soaking for about five hours in each case, a minnow was placed in each of the dishes. The length of time each animal lived was carefully noted, except in those cases where death occurred during the night. The results are given in the following tables:—

WHITE PINE SAWDUST.

Weight of Sawdust.	Volume Water c. c.	Time Soaking.	Time at which minnow was immersed.	Results.
2 grams.	300	From 10 a.m.	2.43 p.m.	Lived about 9 minutes.
"	400	"	"	" "
"	500	"	"	" "
"	600	"	"	" "
"	700	"	"	" "
"	800	"	"	" 10 minutes.
"	900	"	"	" 13 "
"	1,000	"	"	" 15 "
"	1,200	"	"	" 20 "
"	1,500	"	"	" 29 "
"	1,700	"	"	" 29 "

ONTARIO RED PINE.

2 grams.	300	10 a.m.	2.47 p.m.	Lived 47 minutes.
"	400	"	"	" 50 "
"	500	"	"	" 50 "
"	600	"	"	" 1 hour and 28 minutes.
"	700	"	"	" 1 " 14 "
"	800	"	"	" 1 " 14 "
"	900	"	"	" 1 " 53 "
"	1000	"	"	" 2 hours and 20 "
"	1200	"	"	" 2 " 50 "
"	1500	"	"	" 3 " 45 "
"	1700	"	"	" 3 " 45 "

ONTARIO CEDAR.

2 grams.	300	From 10 a. m.	2.33 p.m.	Lived 8 minutes.
"	400	"	"	" 9 "
"	500	"	"	" 19 "
"	600	"	"	" 20 "
"	700	"	"	" 21 "
"	800	"	"	" 22 "
"	900	"	"	" 27 "
"	1000	"	"	" 27 "
"	1200	"	"	" 1 hour.
"	1500	"	"	" 1 " et 48 minutes.
"	1700	"	"	" 1 " et 55 "

6-7 EDWARD VII., A. 1907

BRITISH COLUMBIA CEDAR.

Weight of Sawdust.	Volume Water c.c.	Time Soaking.	Time at which minnow was immersed.	Results.
2 grams.	300	10.15 a. m.	2.51 p.m.	Lived 6 minutes.
"	400	"	"	" 6 "
"	500	"	"	" 15 "
"	600	"	"	" 53 "
"	700	"	"	" 43 "
"	800	"	"	" 1 hour and 9 minutes.
"	900	"	"	Jumped out of dish unnoticed.
"	1000	"	"	Lived 1 hour and 32 minutes.
"	1200	"	"	" 1 " 36 "
"	1500	"	"	" 3 " 50 "
"	1700	"	"	" 3 " 29 "

HEMLOCK BARK.

Bark.				
2 grams.	300	10.10 a. m.	2.36 p.m.	Lived 55 minutes.
"	400	"	"	" 1 hour and 32 minutes.
"	500	"	"	" 1 " 43 "
"	600	"	"	" 1 " 49 "
"	700	"	"	" 2 hours.
"	800	"	"	" 1 hour and 32 minutes.
"	900	"	"	Jumped out of dish unnoticed.
"	1000	"	"	Lived 2 hours and 18 minutes.
"	1200	"	"	" 3 " 24 "
"	1500	"	"	" 4 " "
"	1700	"	"	" 4 " 15 "

HARD MAPLE SAWDUST.

2 grams.	300	From 10.38 a.m. July 15.	July 15, 3.30 p.m.	Lived 2 hours and twenty minutes.
"	400	"	"	July 21, 10 a.m. Still alive.
"	500	" 9	"	" 16. Died last night.
"	600	"	"	" 21, 10 a.m. Still alive.
"	700	"	"	" 16. Died last night.
"	800	"	"	" 21, 10 a.m. Still alive.
"	900	"	"	Lived only 2 hours.
"	1000	"	"	July 18. Died between 4 p.m. and 8 p.m.
"	1200	"	"	Lived 3 hours and 30 minutes.
"	1500	"	"	July 18. Died between 4 p.m. and 8 p.m.
"	1700	"	"	July 20. Died 3 p.m.

This experiment was discontinued July 21, 10 a.m.

ONTARIO CEDAR BARK.

2 grams.	300	10.20 a.m.	2.41 p.m.	Lived 37 minutes.
"	400	"	"	" 1 hour and 20 minutes.
"	500	"	"	" 50 minutes.
"	600	"	"	" 50 "
"	700	"	"	" 1 hour and 20 minutes.
"	800	"	"	" 1 " 31 "
"	900	"	"	" 1 " 40 "
"	1000	"	"	" 1 " 57 "
"	1200	"	"	" 2 hours 10 "
"	1500	"	"	" 4 " "
"	1700	"	"	" 4 " 20 "

SESSIONAL PAPER No. 22a

ELM SAWDUST.

Weight of Sawdust.	Volume Water c. c.	Time Soaking.	Time at which minnow was immersed.	Results.
2 grams.	300	10.44 a.m. July 15.	3.30 p.m.	Lived 4 hours and 30 minutes.
"	400	"	"	Died 10 a.m. July 16.
"	500	"	"	Lived 1 hour and 30 minutes.
"	600	"	"	" 2 hours and 30 "
"	700	"	"	" 1 hour and 30 "
"	800	"	"	July 21, 10 a.m. Still alive.
"	900	"	"	" 18. Died last night.
"	1000	"	"	" 21. " "
"	1200	"	"	Lived 1 hour and 30 minutes.
"	1500	"	"	" 4 hours and 30 "
"	1700	"	"	" 1 hour and 30 "

This experiment was discontinued July 21, 10 a.m.

OAK SAWDUST.

2 grams.	300	Since 10.15 a.m. of 23rd.	July 23. 2.30 p.m. . .	Lived 2 hours and 30 minutes.
"	400	"	"	" 2 " 30 "
"	500	"	"	" 3 " 30 "
"	600	"	"	" 7 " 30 "
"	700	"	"	" 2 " 30 "
"	800	"	2 animals.	{ One lived 2 hours and 20 minutes.
"	900	"	3 animals.	{ July 24. Died last night.
"	1000	"	"	{ One lived 7 hours and 30 minutes.
"	1200	"	"	{ July 24. Died last night.
"	1500	"	"	July 25. Jumped out unnoticed.
"	1700	"	"	" 30, 9 p.m. Still alive. Released.
				Lived 3 hours and 30 minutes.
				July 25, 3 p.m. Dead.

ASH SAWDUST.

2 grams.	300	10.48 a.m. of July 15.	3.30 p.m. July, 15. . .	July 21, 10 a.m. Still alive.
"	400	"	"	Lived 1 hour and 30 minutes.
"	500	"	"	July 21, 10 a.m. Still alive.
"	600	"	"	Lived 1 hour and 40 minutes.
"	700	"	"	Lived 2 hours and 10 minutes.
"	800	"	"	July 21st. Died last night.
"	900	"	"	Lived 1 hour.
"	1000	"	"	July 21, 10 a.m. Still alive.
"	1200	"	"	July 21. Died last night.
"	1500	"	"	July 21, 10 a.m. Still alive.
"	1700	"	"	July 19. Died to-day.

This experiment was discontinued July 21, 10 a.m.

6-7 EDWARD VII., A. 1907

HEMLOCK SAWDUST.

Weight of Sawdust.	Volume Water c. c.	Time Soaking.	Time at which minnow was immersed.	Results.
2 grams.	300	10.15 a.m. of 23rd.	2.30 p.m. July 23.	July 26, 9.30 a.m. Dead.
"	400	"	"	" " " "
"	500	"	"	July 30, 9 a.m. Released.
"	600	"	"	" " " "
"	700	"	"	" " " "
"	800	"	"	July 26, 9.30 a.m. Found dead.
"	900	"	"	Lived 45 minutes.
"	1000	"	"	July 26, 11 a.m. Dying.
"	1200	"	"	" 28, 3 00. Dead.
"	1500	"	"	Lived 1 hour and 45 minutes.
"	1700	"	"	July 26, 9.30 a.m. Dead.

SPRUCE SAWDUST.

2 grams.	300	10.30 a.m. of 23rd.	2.40 p.m. July 23.	Lived 3 hours and 50 minutes.
"	400	"	"	July 24, 9.30 a.m. Found dead.
"	500	"	"	" " " "
"	600	"	"	" 26, " " "
"	700	"	"	" 24, " " "
"	800	"	2 animals.	{ July 24, 9.00. Dying.
"	900	"	"	{ " 25, " Found dead.
"	1000	"	"	July 26, 9.30 a.m. Found dead.
"	1200	"	"	" 30, 9.00 a.m. Released.
"	1500	"	"	" " " Dying.
"	1700	"	"	" 27, 7.30 p.m. Dying.
				" 26, 8.30 a.m. Found dead.

BARK EXTRACTS.

Contrary to opinions expressed in some reports upon sawdust pollution, I found that aqueous extracts from bark of white pine, hemlock and cedar were not nearly so poisonous as the sawdust solutions. The tannin or other material dissolved out from hemlock bark was of course poisonous; but, in a general way, the effect of bark solutions upon adult fish was to kill them by suffocation. The oxidation processes going on in the bark extracts deprived the water of the oxygen usually dissolved in it, and as a consequence fish immersed in it soon died. That this was the true cause of death was evident from the fact that bark solution when aerated, that is, with air made to bubble through it, supported fish life just as well as any normal water would do.

BLACK BASS FRY.

For the successful results obtained in many of my experiments I am indebted to the Department of Marine and Fisheries, Ottawa. On June 27, Mr. Halkett, an officer of the department, brought to me about 100 black bass fry. They had been hatched out in the natural pond at Belleville and were a fine lot of fry, each about an inch long. I placed them in a galvanized-iron tank about 4 feet long, 3 feet wide, the water in it being kept about 3 to 4 inches deep. A copious flow of tap water from Lake Ontario

SESSIONAL PAPER No. 22a

entered the tank and left it continually. A few flat stones were placed here and there on the bottom.

The larger and more pugnacious ones took shelter beneath the stones, the smaller and more timid ones were forced into the corners of the tank, driven away from the stones by their bigger neighbours. I fed them regularly on small and well washed particles of meat, obtained by mincing small earthworms. These fine particles were flipped into the water. As they slowly sank towards the bottom they were seized by the fry and eaten with great avidity. The tank was always clean, and I had no trouble in keeping the fry alive and healthy.

In catching them for the experiments, I used a dip net. The slower ones were, of course, caught first. At the end of three weeks the survivors had become so expert in dodging the net that they were very difficult to capture. They had grown to about $1\frac{1}{2}$ inches in length and correspondingly heavy. The last few could be caught only by drawing the water off from the tank.

CONTROL EXPERIMENTS.

The general method of conducting the experiments has been already indicated. It consisted in immersing fish eggs, fry, fish food (such as aquatic larvae, worms, tadpoles) and adult fish, in varying strengths of sawdust solutions and noting results. In the vast majority of cases a control animal in tap water accompanied the regular experiment, and observations were made upon both at the same time. Hundreds of small minnows were used as well as the black bass fry already referred to. In some experiments the minnows appeared to be the more robust, in other cases the fry.

CRITICISMS.

In some newspaper criticisms of my work at St. Andrews in 1900, objection was made to the statement that sawdust poisoned the water. The writers held that there was no poison in sawdust, and that it killed fish solely by taking out the oxygen dissolved in the water. They asserted that fish eggs and all forms of fish life were killed by suffocation. To test this statement I took some of the yellowish brown sawdust water and made a large quantity of air to bubble through it. When the air was thus passing through the solution I frequently placed fish eggs, and adult fish in this aerated water, but in every instance eggs and fish alike died. They died, therefore, not from suffocation, but from the effects of the poison passing from the water through their gill filaments, and into their blood. When not kept too long in the extract the fish could generally be resuscitated by placing them in fresh water.

DECAYING SAWDUST.

One objection frequently urged against the practice of throwing sawdust into streams and rivers is that the decaying sawdust imparts such a disagreeable odour to the water that sensitive fish are driven away to other waters not so polluted. It seemed to me, therefore, that some progress might be made towards a definite conclusion in this matter, if sawdust were allowed to stand for several weeks in an aquarium and tested from time to time as to the changes going on in it, and the influence of these upon fish.

With this end in view about 1,000 grams of white pine sawdust were placed in an aquarium three feet four inches long, fifteen inches wide, and filled up to sixteen and a half inches deep with fresh water. This was done June 24. No water was allowed to enter or leave the vessel. No direct sunlight fell upon it.

The usual results followed, viz., a well defined layer of pale, yellow water about three-quarter of an inch deep formed in a few hours and lay at the bottom. On top of this was the perfectly clear layer about fifteen inches deep.

6-7 EDWARD VII., A. 1907

After soaking for two days, bubbles of gas began to rise to the surface of the water, but no attempt was made to analyze it. The bottom yellowish layer had become so dense that no object could be seen across it—a thickness of fifteen inches. Its upper surface was sharply marked off from the overlying transparent water by a thin grayish layer. Microscopic examination of this layer showed it to be swarming with bacteria.

For the information of the general reader it may be explained that bacteria are divided into two classes in relation to oxygen. One class can live only when in contact with air (oxygen). These are known as *aerobic* bacteria. The other class can live only in media from which air (oxygen) is excluded. These are known as *anaerobic* bacteria. The anaerobic were present at the bottom of the aquarium, the aerobic, chiefly towards the top. But between these two, were to be found other bacteria which could live and multiply either in the presence or absence of oxygen.

At the end of the week, the water, especially that siphoned off from the bottom, emitted a sweetish aromatic smell. Only about an inch at the bottom had retained the original yellow colour; the next inch had changed to a yellowish brown; then came a grayish layer about one-sixteenth of an inch thick; above this, what had at first been fourteen inches of perfectly clear water had turned to a dark gray, though still quite transparent. Black bass fry placed in the aquarium at this time at first darted to the bottom, but after meeting the poisonous extract once or twice could not subsequently be driven into it. On the contrary they swam along the top with their nose just touching the surface of the water, and behaved as if suffering from lack of air. They lived only about two hours.

Four days after this, black bass fry lived only an hour when placed in the upper 14 inches of water. That they were suffocating was proved by the fact that, on aerating the water, the fry lived in it for 24 hours, and were then apparently well.

In three weeks the upper 14 inches of water had changed to a steel gray colour.

In five weeks the pleasant aromatic odour had given place to a musty disagreeable smell. The laboratory windows being open, mosquito larvæ became numerous in the aquarium and appeared to be feeding upon the bacteria which were very abundant on the surface of the bag, and along the sides of the aquarium.

On July 31, some of the water was siphoned off from the middle of the aquarium and placed outside the laboratory in direct sunlight. Dr. W. T. Connell, Professor of Bacteriology in the University, examined this water on three successive occasions, and compared its bacterial life with that in the aquarium. He found that sunlight and air had killed off those kinds of bacteria which flourish in shade and in absence of oxygen, and stimulated the growth of other kinds of bacteria which flourish in sunshine and moving water. In a fortnight, this water had become odourless, transparent and brownish in colour. Minnows were able to live in it, and soon played havoc with the mosquito larvæ.

The water in the aquarium remained slate-coloured, slimy and foul-smelling for two months longer, when it was thrown out.

SAWDUST BEDS.

No one needs to be told that sawdust undergoing decay in the laboratory and sawdust decaying along the beds of rivers and streams must present different phenomena. In the laboratory experiment, the sawdust is always under water, the water is stagnant, and both sawdust and water are in the shade. Along a stream, sawdust beds are, in spring and early summer, formed under water; late in the season, they are frequently exposed high and dry to the influences of sunshine, shade and wind. Only in shady pools remaining after the spring freshets, could the conditions in decaying sawdust approximate to those in my laboratory experiment. Moreover, there is continually passing over all sawdust beds a slow current of water, which profoundly influences the changes going on in decomposing matter. The running water is slowly and surely extracting the soluble organic matter from the wood cells. Day after day

SESSIONAL PAPER No. 22a

it is withdrawing the poisonous material, so that it is only a question of time, until every particle of poison is withdrawn from the sawdust. In the course of a few seasons at most, nothing can remain, but the perfectly harmless wood fibre.

If my laboratory experiment proves anything, it suggests that bacteria will multiply enormously in old sawdust beds, and will consequently stimulate the multiplication of insect life. If this surmise is correct, it throws light upon a fact which is well known to anglers, viz., that the vicinity of old sawdust beds is a favourite haunt for trout and black bass. Beds composed of freshly made sawdust will drive fish away; but old beds, those which have been leached of their poison, will attract fish, because the sawdust shelters and feeds the larvæ of aquatic insects upon which many fish subsist.

Many anglers could corroborate the following testimony of a writer in *Forest and Stream* :—

‘Obviously, in localities where the entire bottom is embedded by sawdust, fish can neither spawn nor feed; but it happens that such deposits do not form on their breeding places, nor is the area of their foraging ground appreciably diminished by their presence. Even in the half-emptied and now useless ponds, the current constantly scours out a central channel through the sawdust, leaving the bottom clear and pebbly; so that, in fact, these local beds are of no more detriment to the fish than so many submerged logs. The trout can range far and wide without encountering them at all. Yet, strange to say—that is, it must seem strange to those persons who take it for granted that sawdust kills fish—the most likely places for the larger trout are these self-same pebbly channels in the old ponds, along whose edges, despite a hundred freshets and ice-shoves, the persistent sawdust and tanbark lie in wind-rows so deep that the wader feels as if he were going to sink out of sight whenever he puts his foot into the yielding mass, every movement of which stirs up a broadening efflorescence which spreads for rods away, distributing itself throughout the stream.’

NUTRITIVE RELATIONS.

The connection between a few links in the chain of animal life was apparent enough in the decaying sawdust. Wood extracts supported bacteria, bacteria supported mosquito larvæ, and these again supported fish life. A similar relationship exists in nature. Leaves, branches, and trunks of dead trees are decomposing continuously in our forests. Their cell contents are dissolved out by rain and melting snow, and are in part carried away in streams and rivers. Bacterial life is abundant in all woodland streams, and must be important as food for aquatic insects. With the disappearance of our forests, the bacterial life of streams and rivers must change completely in character, and so must the insect life found along their course. And if the insect life dwindles or disappears, so must the fish life which subsists directly or indirectly upon it. But the great destroyer of fish life is man.

INFLUENCE OF MAN.

The Anglo-Saxon has always been a disturbing factor in the balance of life. Forests, game and fish all disappear with his arrival. To get good fishing or good hunting now-a-days one must travel back to unsettled districts. No one expects game to be plentiful along the settled shores of Lake Ontario, but many people are amazed that fish are not abundant in it. They still hug the pleasing delusion that if brooks have been overfished the fish hatchery can restock them. But with the disappearance of our forests it is exceedingly doubtful whether we can ever again, by all the help of hatcheries, overseers and fish commissioners, re-people the streams which have been depleted by man through deforestation and over-fishing. He has upset the balance of life; it can only be fully restored by a return to primitive conditions. When game, therefore, becomes plentiful on the streets of Ottawa city, fish will be equally abundant below the saw-mills of the Chaudière falls. The conditions are almost if not quite parallel.

ON THE BONNECHÈRE RIVER.

A final judgment cannot at present be pronounced upon the poisonous effects of sawdust. These effects must be studied near the mills and along the sawdust beds of various rivers. A three weeks' study of the Bonnechère river, a tributary of the Ottawa, much polluted with mill rubbish, led me to modify very considerably the conclusions which I had based upon my laboratory experiments. I visited the mill represented in two of the illustrations of this report fully expecting that not one fish could survive in such surroundings. But pike were abundant for miles below the mill, and fish (chub) could be caught any day along the side of the submerged driftwood. Stranger still, the fish so caught lived for three hours in a pailful of sawdust water drawn from the very centre of a sawdust bed. A few brook trout had been caught earlier in the season just below the mill when it was running. At the date of my visit, August 20, 1902, the mill had been closed for seven weeks and no sawdust was then passing into the river.

The owner of the mill furnished me with the data necessary to calculate the percentage of sawdust in the water passing his mill every twenty-four hours. The water contained .004 per cent of sawdust by weight.



FIG. 5.—Sawmill on the Bonnechère River, a branch of the Ottawa. Sawdust and edgings pass into the river from the end of the mill.

Comparing this percentage with that in two of the laboratory experiments described on pages 42 and 43, we find that in one case two grams of white pine sawdust in 1,700 c.c. of fresh water, *i.e.*, .12 per cent strength, soaking for five hours, killed a minnow in twenty-nine minutes; and in the other case a percentage of .16 killed in ninety minutes. That is, there was forty times more water in proportion to sawdust in the Bonnechère river than in one of my laboratory experiments in which a minnow lived for ninety minutes.

The strength of a cup of tea depends upon the proportion of tea leaves to water. And in the same way, the extent to which any stream is polluted with sawdust depends mainly upon two things, *viz.*, (1) the quantity of sawdust, and (2) the volume of water into which the sawdust is discharged. No stream, therefore, can be pronounced off-

SESSIONAL PAPER No. 22a

hand as poisoned by sawdust. Each stream must be studied by itself, and the varying conditions must be understood before a judgment can be pronounced.

Of course, the percentage of sawdust in the Bonnehère is a mere approximation, but it points unmistakably to the conclusion that the sawdust poured into the Bonnehère river is not destroying its fish life. Moreover, in Golden lake, an expansion of this same river, and ten miles above any saw-mill, lake trout used to be very abundant. Every October large numbers were caught in nets along their spawning beds. Now these spawning grounds are reported to be deserted by the fish, and certainly sawdust



Fig. 6.—Slabs, edgings and sawdust, half-a-mile below the mill.

cannot be blamed for their disappearance. Higher up the river, in Round lake, the October fishing is still good, solely because there are fewer settlers and less fishing.

ON THE OTONABEE RIVER.

R. M. Dennistoun, Esq., K.C., of Peterborough, has finished the following interesting account of his observations on the Otonabee river:—

‘When I was a boy I fished continuously in the river and caught small perches, chub, suckers, &c. A few years later no fish were caught in the river at all, and there were great beds of sawdust in all the slack water. About the year 1893, the Dominion Government absolutely prohibited the placing of sawdust in the river. At this time the little lake at Peterborough was a horrible place. The sawdust lay upon the bottom to the depth of 8 or 10 feet in some places, and the gases which were generated would suddenly burst upwards with such force as to render canoeing unpleasant and even dangerous. It took several years, after the placing of the sawdust in the river had been stopped, to wash out the accumulated deposits, but successive spring freshets accomplished this.

In a very few years we began to notice that small fish were returning; then came the large fish, and now we have excellent fishing for bass, in all parts of the river, right through the centre of the town of Peterborough. We have good maskinonge fishing in the little lake which is adjacent to the town, and which was formerly nearly filled with sawdust. I can now go down on a June morning to the river just below my house, and cast a fly with invariable success, and no amount of theory or argu-

ment would shake my knowledge of the fact that this is due entirely to the removal of the sawdust from the river. There are now several fishing clubs in Peterborough. The Peterborough Lock Company and the Canadian General Electric Company each has a fishing club composed of workmen from the factories. This will satisfy you that the fishing is now worth something.'

The conditions which Mr. Dennistown describes are quite different from those on the Bonnechere. On this river, below where I made my observations, there is a fairly rapid current for 5 or 8 miles, and no slack water or pools excepting at the Douglas dam. The rapid current aerates the water, promotes microbic action upon the wood extracts, and tends to self-purification, whereas on the Otonabee river, the conditions would approximate to those of decaying sawdust in a laboratory aquarium; fish not driven out of the 'slack' water and sluggish lake would lie killed by the poisonous extracts, or suffocated in the water which had lost its oxygen.

ON THE OTTAWA RIVER.

The question of whether the Ottawa river is so greatly polluted with sawdust as to diminish its fish life, has been much debated. Assertions could be obtained in abundance both *pro* and *con*, but assertions prove nothing. The indications are all against the popular idea that sawdust is destroying the fish of the Ottawa.

In the first place, we have the testimony of the chemist. Mr. A. McGill, B.A., assistant analyst in the Inland Revenue Department, in 1890, made an exhaustive series of analyses of the Ottawa river water at two different seasons of the year, and as a result of his investigations reported: 'As to the fitness of the Ottawa water for domestic uses, I may say that it contains nothing that must necessarily render it unwholesome.' If Mr. McGill could find nothing in the water that would be likely to harm human life, it is quite unlikely that fish would be injured by it. At any rate, no one has ever proved that Ottawa river water kills fish, and until this is proved, ordinary mortals may well be excused from believing it.

In the second place, many competent observers living along the banks of the Ottawa claim that fish are not injured by the mill rubbish that has for years been drifted into the river. Mr. W. C. Edwards, M.P., is one of these. Writing to me under date of July 19, 1902, he said. 'I have lumbered on the Ottawa river for thirty years, during which time I have never put sawdust or mill refuse into the stream. I have, however, observed what has been going on, and it is not my observation that sawdust has anything to do with deteriorating the number of fish in the river. We have the same kinds and about the same quantity of fish in the Ottawa as we had twenty-five years ago. We think a wonderful lot of nonsense has been preached with regard to this matter. Conditions may possibly be different in very small streams, but so far as the Ottawa is concerned, if we had double the saw-mills on it that it has, and if all the sawdust went into the stream, neither the fishing interests nor navigation to any appreciable extent would be injured.'

Mr. Hiram Robinson, president of the Hawkesbury Lumber Company, writes: 'While we were putting sawdust into the Ottawa at this place, I never knew fish to be affected by it, having frequently seen good sturdy fish caught in our ponds just below the mill.' Sawdust is not now drifted into the river by this company.

Taken along with the opinions of Professor Prince and Mr. S. T. Bastedo, the observations of Mr. Dennistown upon the Otonabee river, and of Messrs. Edwards and Robinson upon the Ottawa show how necessary it is that a thorough investigation should be made into the whole subject.

My own conclusions, based upon laboratory experiments, may be summarized as follows:—

SESSIONAL PAPER No. 22a

CONCLUSIONS.

1. Strong sawdust solutions, such as occur at the bottom of an aquarium, poison adult fish and fish fry, through the agency of compounds dissolved out of the wood cells.

2. The overlying water in such an aquarium does not at first kill fish. After about a week it does kill, but solely through suffocation, the dissolved oxygen having all been used up.

3. Bacteria multiply enormously throughout all parts of such an aquarium, and through oxidation change the poisonous extracts to harmless compounds. Mosquito larvæ live on the bacteria. No doubt, in natural pools, other aquatic insect larvæ live on bacteria also.

4. Subsequent aëration and sedimentation of sawdust water purify it, so that fish can live in it without injury.

5. Since adult fish and black bass fry both refused to be driven into pine extracts in the bottom of an aquarium after they had experienced its poisonous effects, we may infer that fish would desert a river much polluted with freshly made sawdust, going down stream and into tributaries to escape from the disagreeable influence of the sawdust extracts.

6. Further observations and studies along sawdust polluted streams and rivers in Canada are urgently needed before more definite conclusions can be reached. My own observations on the Bonnechere are not sufficient to enable me to form any conclusion that would be applicable to other rivers. In this connection I should like to quote Professor Prince again: 'Circumstances modify the effects of all forms of pollutions, so that waste matters which would be deadly in one river will pass away and prove of little harm in another, where the conditions are different.'

ACKNOWLEDGMENTS.

I must add finally, acknowledgment is due to Toronto University, the Public Library, Toronto, and the Canadian Institute, for the privilege of consulting their libraries in order to write the historical part of this report.

I am under special obligations to my colleague, Prof. J. C. Connell, M.A., M.D., for the large supply of minnows which he procured for me, and which were so indispensable for the laboratory experiments.

Dr. John Waddell and Mr. C. W. Dickson, M.A., both of the School of Mining, Kingston, rendered valuable aid in determining the amount of solid matter in sawdust water.

The Ontario Fisheries Department greatly facilitated my task on the Bonnechere by instructing their overseers to assist me in every way possible.

APPENDIX TO DR. KNIGHT'S REPORT ON SAWDUST AND FISH LIFE.

BACTERIOLOGICAL EXAMINATION OF SAWDUST WATER IN SHADE AND IN SUNSHINE.

Examination of sawdust water in aquarium made July 31, 1902.

Two agar plates made. The first averaged 3,300 colonies of bacteria per cubic centimetre. None of the colonies were spirilla which were present in large numbers in direct microscopic examination of the water. The chief colonies were those of a spore bearing bacillus, a variety evidently of *B. Subtilis*; also a few sarcinae, par-

6-7 EDWARD VII., A. 1907

ticularly one like *Sarcina Lutea*. The second plate averaged 3,570 colonies per cubic centimetre. In general characters they were the same as in the first plate.

August 4, 1902. Water in aquarium. Agar plates averaged 3,570 colonies per cubic centimetre. These were in all respects like those of July 31.

Same water in sunlight since July 31. Agar plates average 4,200 colonies per cubic centimetre. These colonies contain the same bacteria as in the aquarium water, but in fewer numbers. Further, there is present a fluorescent bacillus, making up half the number of colonies present.

August 8, 1902. Water in aquarium. Agar plates develop 7,870 colonies per cubic centimetre. These colonies are of the same type as those found on previous plates with the addition of about 1,000 colonies of *B. Mesentericus Vulgatus* per cubic centimetre.

Water in sunlight. Agar plates develop 37,070 colonies per cubic centimetre. These consist mainly of *B. Fluorescens Liquescentis*; also of *Sarcina Lutea*, and an occasional colony of *B. Subtilis*.

W. T. CONNELL,
Prof. of Bacteriology.

V

THE DIATOMACEÆ OF CANSO HARBOUR, NOVA SCOTIA.

A PROVISIONAL LIST.

By DR. A. H. MACKAY, SUPERINTENDENT OF EDUCATION FOR NOVA SCOTIA.

The following determinations of *Diatomaceæ* from Canso harbour were made from collections taken on September 10, 1902, just before leaving the Marine Biological Laboratory of Canada for the second and last time during the season. One collection was from the scrapings and washings of *Zostera marina* L. in the shallow water near the laboratory, the other from the drippings and washings of *Chorda filum* L. a few hundred yards to the east of the laboratory. In addition I was given a small vial of a schizonematous diatom growing in minute gelatinous colonies which mimic minute species of *ectocarpus*, &c., collected by Mr. C. B. Robinson on the piles of some of the wharves.

As my previous studies of the *Diatomaceæ* were confined to those found in fresh-water deposits, I required more time than I could afford to make a complete study of the rarer species in the collections before the date given me to complete my report. In addition I had the misfortune to be accidentally without any lens of higher power than a one-twelfth inch oil immersion, so that I was unable to make out some of the finer details necessary to determine some of the species, or to measure the number of striæ when more numerous than fifteen to ten microns.

My reference authorities are as follows: 1. 'Diatomaceen Typen-Platte,' No. 484 of J. D. Møller, Wedel in Holstein, April, 1878, containing about 400 types. 2. A. Schmidt's 'Atlas de Diatomaceenkunde,' up to plate 160. 3. George Karsten's 'Die Diatomeen der Kieler Bucht.' 4. Rabenhorst's 'Flora Europæa Algarum Aquæ Dulcis et Submarinæ.' 5. Van Heurck's 'Synopsis (et Atlas) des Diatomées de Belgique.' 6. Peragallo's 'Diatomées Marines de France,' in 'Le Micrograph Préparateur' to date. 7. Wolle's 'Diatomaceæ of North America.' 8. 'Le Diatomiste,' volumes I. and II., 1890 to 1896. 9. 'Diatomées Fossiles du Japon' by Brun of Geneva and Témperé of Paris. 10. 'Diatomées des Alpes et du Jura et de la Région Suisse et Française des Environs de Genève,' par J. Brun.

A few plankton forms were taken in the collections and also some fresh-water species. But from the *Chorda filum* the great mass consisted of *Striatella unipuncta* Ag. and *Licmophora Lyngbyei* (Kg.) Grun., forming more than 90 per cent probably of the whole mass of diatomaceous material. Several species were seen but lost before determination. I, therefore, present the following list as a provisional one; and propose to still further examine the material from Canso, and to supplement it by a study of the *Diatomaceæ* of Halifax harbour, which I am in a position to be able to explore with more convenience.

The dimensions—length and breadth of valve—are given in microns, which for the sake of compactness are expressed simply in figures. Likewise, the number of striæ, ribs or rows of pearls in 10 microns are given in figures simply.

PROVISIONAL LIST.

1. *Amphora* _____ (?).
2. *Cymbella* _____ (?).
3. *Stauroneis anceps* Ehr., 18 × 6. One specimen.

4. *Stauroneis ventricosa* Kg., 45×9 . One specimen.
 5. *Navicula viridis* Kg., 100×18 , Ribs 7 or 8 to 10 microns. Only one specimen.
 6. *Navicula acuminata* W.S., 87×10 , Striæ very fine. One specimen.
 7. *Navicula cancellata* Donk., 52×24 to 58×26 . About 40 ribs, 6 to 10 microns. In *Chorda filum* collection.
 8. *Navicula distans* W.S., Fragments. Striæ 4 or 5. Two specimens.
 9. *Navicula didyma* Ehr., 45×19 to 70×25 . Striæ about 8. The dimensions are more fully expressed as follows, ranging from $45 \times (19:16:19)$ to $70 \times (25:19:25)$, the middle figure within the bracket indicating the breadth at the middle. Common in the *Zostera* collection.
 10. *Navicula entomon* Ehr., $39 \times (14:9:14)$ to $77 \times (24:17:24)$. Striæ 10 or 11. Not so common as *N. didyma* in the *Zostera* collection.
 11. *Navicula Smithii* Breb., 67×40 to 70×42 . Striæ 6 or 7. Not common.
 12. *Navicula forcipata* Grev., 45×20 . Rare.
 13. *Navicula aspera* Ehr., 100×24 to 120×25 . Striæ from 19 to 13. Somewhat common.
 14. *Navicula Baileyana* A. S., Var. (?). 63×33 . Striæ 9 or 10. This may be a variety of the following. One specimen.
 15. *Navicula marina* Ralfs., 80×33 . Striæ 9. One specimen.
 16. *Navicula corymbosa* Ag., 21×3.5 to 27×5.5 . Striæ very fine. Averaging 24×5 . They grew massed on filamentous fronds of gelatine which subdivide like minute branching olive colored seaweed, attached to the piles supporting the wharves. This is a *Schizonema* of the older writers, and does not appear to be very different from the following species, according to Rabenhorst. Karsten differentiates them more widely.
 17. *Navicula ramosissimum* Ag., 30×4.5 to 30×6 . Striæ 13. Found with the above, of which it may be a variety.
 18. *Navicula mollis* W.S., 40×6 . Found sparingly with the above; but whether it is a distinct species or not is a matter of doubt.
 19. *Navicula pelliculosa* (Breb.) Hilse., 13×11 . Striæ invisible with a one-twelfth oil immersion lens.
- With further study the last four determinations may require to be revised. A stronger lens and a study of the plants in their habitat may give additional information. There appears to be a lack of agreement in important particulars between the ideas held of these species by several of the authorities named above.
20. *Pleurosigma decorum* W.S., 220×27 to 240×35 . Oblique striæ cutting at about 70° . Oblique striæ 12 or 13; horizontal about $15 \pm$.
 21. *Pleurosigma Aestuarii* S.W., 97×23 . Striæ just visible in the one-twelfth. This looks also very much like *Pl. latum*, Cl. as figured and described by Peragallo. One specimen observed.
 22. *Pleurosigma Balticum* W.S., 270×30 . Several specimens seen.
 23. *Rhoicosigma* ————— (?).
 24. *Rhoicosphenia curvata* (Kg.) Grun. Var. *marinum*, 30×12 to 35×12 . Striæ $15 \pm$.
 25. *Achnanthes subsessilis* Kg., 56×9 to 60×20 . Striæ 8 or 9. Not very rare.
 26. *Achnanthes longipes* Ag., 80×33 . Large striæ 6 in 10 microns with two rows of pearls between each. Small striæ about 14. Rare. Found only with the *Navicula corymbosa* material.
 27. *Cocconeis scutellum* Ehr., 20×12 to 27×18 . Rows 12. Very common.
 28. *Cocconeis costata* Greg., 11×6 to 18×7.5 . Striæ about 10. Common. Can hardly be a variety of the preceding species.
 29. *Cocconeis ambigua* Grun., 12×5 to 13×7 . Doubtful.
 30. *Eunotia* ————— (?), $69 \times (5:6:7:6:5)$. Striæ 13. Comes near *Eunotia pectinalis* (Kg.) Rab.; but the centre is swollen symmetrically both above and below the general arch. That is the ends are about 5 microns, the general length about six microns thick, while the middle swells abruptly to about 7 microns in thickness.

SESSIONAL PAPER No. 22a

31. *Eunotia* ————— (?) , 21×14 , striæ about 15. One specimen.
32. *Synedra affinis* (Kg.), $75 \times (3.5:4:3.5)$ to 90×3.5 , Striæ 13. Not uncommon in *Chorda* collection.
33. *Synedra Gallionii*, Ehr., $240 \times (6:7:6)$ to $300 \times (7:8:7)$. Striæ 10 or 11. Rather common in *Chorda* and also *Zostera* collections.
34. *Synedra crystallina* (Lyngb.) Kg., $375 \times (9:8:11:8:9)$ to $600 \times (10:8:13:8:10)$. Striæ 15 +. Common.
35. *Synedra fulgens* (Kg.) W. S., $240 \times (9:7:10:7:9)$ to $340 \times (10:8:12:8:10)$. Striæ 12 to 14 or more. Karsten's *S. crystallina* does not appear to agree with Moller's type nor with the descriptions and figures in Van Heurck and Wolle, for instance. Van Heurck's *S. fulgens* is practically a reduced *S. crystallina*. Many of the specimens in these collections where *S. fulgens* is very common, while retaining the general shape of the larger species, have the striation generally coarser instead of finer. At least this appears from a large number of estimates if not exact measurements which I noted.
36. *Synedra undulata* (Bailey) Greg. $550 \times (7:4:9:4:7)$. Striæ about 12. Only one specimen of this splendid species has been noted, and it is in close agreement with the type.
37. *Homœocladia capitata* H. L. S. 22×3 . Striæ $12 \pm$. From its smallness the determination of this species may be considered doubtful.
38. *Fragillaria hyalina* (Kg.) Grun. (?)
39. *Fragillaria Pacifica*, Grun. 25×6 . Striæ 15. (?)
40. *Fragillaria amphicephala* Ehr. 45×11 . Striæ not visible in the 1-12. Doubtful, as only one specimen was noted.
41. *Licmophora Lyngbyei* (Kg.) Grun. $40 \times (12:3)$ to $60 \times (24:3)$ to $80 \times (8:2)$. Striæ about 15 or less. This is the species which next to *Striatella unipuncta* is the most abundant in the *Chorda* collection. It is possible that the variations of proportion observed may be too great for combination into one species. A separation of the species, if there are more than one, requires more investigation of the plants in their habitat.
42. *Licmophora* ————— (?) . Somewhat ovate-fan shaped like *Podosphenia Baileyi* of Edwards. Roundish but drawn at the base into a cuneate stem. Height and breadth varying from 40×25 to 50×28 to 54×33 to 66×47 to 67×45 . A central line, sometimes doubled runs like the midrib of a leaf through the delicate frond which generally shows under the 1-12 oil immersion, a faint striation at right angles to the midrib, which striation becomes fainter as it ascends until it becomes invisible before the middle of the frond is reached. It does not appear to be strongly silicified, for prolonged boiling in nitric acid decomposes it. When heated on the cover glass before being mounted in balsam it is more or less distorted. Lack of time has prevented my complete study of the form; so that I can merely say it may be a diatom, and it may not.
43. *Grammatophora marina* (Lyngb.) Kg. 30×10 to 40×15 to 42×9 . Striæ often not visible in the 1-12th. Common.
44. *Grammatophora Oceanica* Ehr. 54×9 to 70×15 to 75×12 . Striæ invisible. Not uncommon. Looks often like *Gr. stricta*, Ehr.
45. *Grammatophora* ————— (?) 30×15 to 45×16 . Striæ: 12 to 13. Like a variety of *Gr. angulosa* Ehr., or of *Gr. serpentina* Ehr. with the serpentine line shortened to three undulations—a Greek *e* depending from a stemmed hook.
46. *Striatella unipuncta* Ag. Valves 60×18 to 80×20 to 87×24 . Groups 78 to 107 microns across. The most abundant diatom, especially in the *Chorda* collection.
47. *Rhabdonema arcuatum* Kg. Valves 30×14 to 57×30 to 70×21 . Groups across valves 54 to 73 to 105. Striæ 6 to 8. Common.
48. *Nitzschia punctata* (W.S.) Grun., 44×18 to 50×18 . Rows of pearls 8 to 10 microns. With the *N. corymbosa* collection.

6-7 EDWARD VII., A. 1907

49. *Nitzschia vermicularis* (Kg.) Grun., $165 \times (9:12:9 \text{ to } 175 \times 13 \text{ to } 210 \times (7.5:9.5:7.5))$. Pearls about 7.
50. *Nitzschia lanceolata* W. S., 140×12 . Pearls about 6 to 10 microns. One specimen in *Zostera* collection.
51. *Nitzschia plana* W. S., 150×17 . Striæ (coarse and fine) 7 and 18. One specimen noted.
52. *Nitzschia Sigma* W. S. Var. *intercedens* Grun., $280 \times 8 \text{ to } 295 \times 15$. Striæ about 6. Not uncommon.
53. *Nitzschia Closterium* W. S., 120×6 . Not strongly silicified.
54. *Nitzschia paradoxa* Grun., 100×5 . An interesting plankton species.
55. *Surirella Gemma* Ehr., 108×50 . Costæ 2 or 3 to 10 microns. One specimen.
56. *Campylodiscus decorus* Breb. One specimen.
57. *Campylodiscus*———(?). Suborbicular, 50 microns in diameter. Marginal costæ against larger and smaller parts of circumference about 2 or 2.5 to 10 microns. Subcentral area 50×22 with striæ running from ends of costæ into a slightly curved and eccentric diameter line; 10 striæ to 10 microns. Approaches *C. Thuretii* Breb. and *C. Samoensis* Grun. Van Heurck's description of *C. Thuretii* applies exactly to the specimen, although the figure given in the Atlas shows something like three pseudoraphes instead of the one referred to above as the curved excentric diameter.
57. *Chætoceros Janischianum* (?). A plankton form of which one specimen was observed in a mount from one of the collections.
58. *Melosira distans* Ag. Diameters 9 to 14. Length of joints 5 to 7.
59. *Melosira sulcata* Kg. (?).
60. *Melosira sculpta* Ehr., 21 to 24 in diameter. Joints or frustules 5 to 6.
61. *Melosira granulata* (Ehr.) Ralfs. 18 to 22 in diameter, 48 points around circumference of frustule. Frustule 18×6 . Rows of granules 9 in 10 microns.
62. *Melosira nummuloides* Ag. Diameter 12 to 27 microns. Quite abundant in the *N. corymbosa* material. Very faint, irregular and defective longitudinal wavy striations, closer than one micron when not defective, just visible on the frustules.
63. *Biddulphia aurita* (Lyngb) Breb. $(12 + 15 + 10) \times 16.5$, $(12 + 18 + 12) \times 24$, $(12 + 14 + 11) \times 27$, $(10 + 12 + 11) \times 30$. Rows of points about 10 in 10 microns, and uniform over middle segment and end segments. The type of this species in Moller's Typen-Platte, has larger granules or points on the domed end segments.
64. *Biddulphia Roperiana* Grev. $(14 + 28 + 12) \times 37$ to $(18 + 23 + 13) \times 62$. Rows of points about 7 to 8 on cylinder, more crowded on domes. These two last species are not uncommon; and they look so much alike that it is a question if they should not be considered two varieties of the same species.
65. *Triceratium*———(?). Specimen 12 microns in diameter.
66. *Auliscus*———(?) One specimen seen but lost.
67. *Actinoptychus undulatus* Ehr. (?).
68. *Actinocyclus*———(?). Diameter 45 microns.
69. *Hyalodiscus subtilis*, Bailey. Diameter 24 to 27. Dark center 8 to 10.
69. *Cyclotella operculata* Kg. (?). Diameter 12 microns.
70. *Coscinodiscus radiatus* Ehr. Rare.
71. *C. robusta* Grev. Fragment. Each alveolus 3 microns in diameter.
72. *C. excentricus* Grun. (?). Diameter 25 microns.
73. *C. concavus* Ehr. (?) 45 microns in diameter.

VI

REPORT ON THE FLORA OF CANSO, NOVA SCOTIA.

BY PROF. JAMES FOWLER, LL.D., F.R.S.C., QUEEN'S UNIVERSITY,
KINGSTON.

During the summer of 1901 the writer enjoyed the privilege of spending a part of the season (June 28 to August 26) at Canso, N.S., collecting specimens of the flora occurring in the neighbourhood. Through the kindness of Professor Ramsay Wright, assistant director, who had charge of the Biological Laboratory, he was furnished with table, room and other conveniences, and was thus enabled to make it his headquarters during his visit to the locality. The town of Canso is situated on the most eastern point of the mainland of North America south of Labrador, at the entrance to Chedabucto bay, on the sixtieth degree of longitude, and nearly due south of the town of Arichat on Isle Madame. It is consequently exposed to the cool, damp winds and frequent fogs of the Atlantic coast. The district around is composed very largely of barren rocks and bogs varied by the presence of a few huge mounds of glacial debris. Two of these, rising respectively to the height of 119 and 117 feet, furnish an imposing background to the eastern part of the town. Every visitor who wanders over these heights on a clear summer day must be impressed by the grandeur of the view. Northwards the eye wanders over a vast extent of sea and islands across the bay to Isle Madame in Cape Breton; on the west and south the expanse of rock and bog and hill stretches away to the distant horizon, and on the east a few islands lie near the shore, and the great ocean stretches away beyond. The large number of fishing vessels and boats in the harbour at all times give it a very lively and pleasing appearance.

PECULIARITIES OF THE VEGETATION.

1. The first peculiarity that attracts the attention of the visitor, especially if he is interested in botanical pursuits, is the almost total absence of trees as far as the eye can see. No shade trees are planted, their absence being abundantly compensated for by the cool sea breezes and fogs. Two species of European Willows (*Salix viminalis*, L., and *S. fragilis*, L.) are common near dwelling houses and seem to have been introduced by the early settlers. The ancient forest has been all cleared away by the axe and the fires of previous generations, and over a large area only bare rocks and intervening bogs greet the eye. The glacial mounds, mentioned above, constitute nearly the whole of the cultivated land and have been partially transformed into grass fields. At Hazel Hill, about a mile and a half distant, the prospect is much more cheerful. The beautiful houses erected by the Commercial Cable Company for their employees, are situated on the side of a hill, and command an extensive view of hills and lakes and barren plains and bogs.

2. Another notable characteristic is the prevalence of low, stunted forms of vegetation, not only on the rocks, but on the shores and the hillsides. Herbaceous species which should attain a height of two or three feet are dwarfed to a few inches, except in specially sheltered positions. The most common species of pine (*Pinus divaricata*, Ait., *P. Banksiana*, Lambert) sends down its roots into the clefts of the rocks and spreads over the surface, producing abundance of flowers and cones before it attains

a height of three feet above the ground. Spruce and fir trees, only a few feet in height, produce thick, strong trunks to resist the winter gales to which they are exposed, and furnish a suitable shelter around their base for a few lowly forms such as the Twin-flower (*Linnaea borealis*, L.) and the little wintergreen (*Pyrola secunda pumila*, Gray.) The prostrate form of the Juniper (*Juniperus nana*, Willd), the Crowberry (*Empetrum nigrum*, L.) and two species of cranberries are exceedingly abundant, where suitable ecological conditions prevail. In exposed situations, where other plants are often wanting, the three-toothed cinque-foil (*Potentilla tridentata*, Ait.) often covers the surface and continues flowering during the whole summer. Portions of many of the bogs are brilliant with the pitcher plant (*Sarracenia purpurea*, L.) or with the two beautiful orchids *Limodorum tuberosum*, L., and *Arethusa bulbosa*, L. The Baked-Apple Berry (*Rubus Chamæmorus*, L.) is also exceedingly abundant. The bogs are covered with various species of Sphagnum, whilst a few native grasses, intermingled with imported species, form a thick sward, wherever sufficient soil exists to secure a foothold.

3. The exceedingly small number of introduced weeds in the town and the neighbouring districts is another striking peculiarity. No large areas occur covered with buttercups (*Ranunculus acris*, L.) or Dandelions, as in many districts in the Dominion. Even thistles are confined to a very few exceedingly limited spots. Only a single specimen of *Senecio Jacobææ*, L. (the stinking Willie of Pictou), which is such a pest to the farmers in some other localities, especially in the county of Pictou, was seen during the whole season. The sheep sorrel (*Rumex Acetosella*, L.) so abundant elsewhere was difficult to find. In a small patch of wheat near Hazel Hill—the only patch seen in the neighbourhood, the common Corn Spurrey (*Spergula arvensis*, L.) had found a temporary foothold, having been sown, no doubt, with the grain. The Ox-eye Daisy (*Chrysanthemum Leucanthemum* L.) and the Plantain (*Plantago major*, L.) were probably the most abundant of the introduced weeds. The field mustard (*Brassica arvensis*, L.) which has taken possession of many farms in Ontario, was only conspicuous by its almost complete absence.

CAUSES OF THE SMALL NUMBER OF SPECIES.

The existence of these peculiarities naturally suggests inquiry into the causes to which they owe their existence. The following seem to be the most influential factors producing the present condition of the vegetation:—

1. 'A very high authority on the natural sources of our Dominion once explained to Lord Lansdowne, in answer to an inquiry, that the chief industry of Canadians was the destruction of forests.* The early settlers were compelled by force of circumstances to fell the forests to procure materials for buildings, and also for fuel. Fires are always necessary for the clearing of land, and generally spread over the whole area where brush or fallen trees furnish combustible supplies. Where the soil is thin, or consists of humus produced by decaying vegetation, the whole surface may be destroyed, and only bare rock remain where a dense forest growth had previously existed. At the present time, whenever a young tree attains sufficient size to be of any service for any purpose it is immediately cut down and removed. The destruction of the trees necessarily involves the destruction of all the species of plants that grow under their shade, and of all the mosses, lichens and fungi that find a congenial home on their trunks and roots. The exposure of the rocky surfaces to the fierce winds of winter prevent the growth of even the lowest forms of vegetation, except in sheltered situations. These facts account for the small number of native species occurring in the neighbourhood.

2. Very little cultivated land exists in the neighbourhood of the town. A few grass fields on the glacial mounds, and a very limited number of gardens, constitute

* W. H. Muldrew, Sylvan, Ontario, p. 3.

SESSIONAL PAPER No. 22a

the whole area subject to cultivation. As a consequence, no importation of foreign grains with their accompanying weeds takes place. The lack of railway communication also prevents the introduction of the many species of weeds which travel by train, and accounts in a large measure for the fact that so few foreign plants have reached the locality.

3. The domestic animals enjoy the liberty of the streets and wander over the uncultivated lands at will, appropriating every vegetable product suited to their taste. The species of plants fitted for their food are consequently subjected to a severe struggle for existence, and only a few are successful in finding defensive retreats among the rocks, thus securing a precarious tenure of life.

4. The most important ecological factors are the chill sea breezes and the Atlantic fogs. These prevent the growth of many species of plants found in other parts of the province where the average temperature and the amount of sunshine during the summer months are much greater. The ice floes, brought down by the current from the north in spring, lower the temperature of the sea waters and of the atmosphere above them, whilst the heated plains and fields of the interior attract the cool breezes to fill the vacancy produced by the ascending aerial currents. The situation of Canso exposes it to the full influences of the winds from the Atlantic, and renders it a pleasant retreat for those who flee from the heated towns of the interior or of the south.

LIST OF PLANTS COLLECTED AT CANSO, NOVA SCOTIA, JUNE 29 TO AUGUST 24, 1901.

BY PROF. JAMES FOWLER.

NOTE.—The nomenclature is that of Brown and Britton, Illustrated Flora.

I. *Ranunculaceæ*.

1. *Coptis trifolia* (L.) Salisb.
2. *Oxygraphis cymbalaria*, Prantl.
3. *Ranunculus acris*, L.
4. *Ranunculus repens*, L.
5. *Thalictrum polygamum*, Muhl.

II. *Nymphaeaceæ*.

6. *Castalia odorata*, Woodv.
7. *Nymphaea advena*, Soland.

III. *Sarraceniaceæ*.

8. *Sarracenia purpurea*, L.

IV. *Cruciferae*.

9. *Brassica arvensis* (L.), B.S.P.
10. *Bursa bursa-pastoris*, Britton.
11. *Cakile edentula* (Bigel.), Hook.

V. *Violaceæ*.

12. *Viola blanda*, Willd.

VI. Caryophyllaceæ.

13. *Alsine graminea*, (L.) Britton.
14. *Alsine media*, L.
15. *Ammadenia peploides*.
16. *Cerastium vulgatum*, L.
17. *Moehringia lateriflora*, L.
18. *Sagina nodosa*, (L.) Fenzl.
19. *Sagina procumbens*, L.
20. *Spergula arvensis*, L.
21. *Tissa marina*, (L.) Britton.
22. *Tissa rubra*, (L.) Britton.

VII. Hypericaceæ.

23. *Hypericum Canadense*, L.
24. *Triadenum Virginicum*, (L.) Raf.

VIII. Geraniaceæ.

25. *Oxalis Acetosella*, L.

IX. Ilicineæ.

26. *Ilex verticillata*, (L.) Gray.
27. *Ilicioides mucronata*, (L.) Britton.

X. Sapindaceæ.

28. *Acer rubrum*, L.

XI. Leguminosæ.

29. *Lathyrus palustris*, L.
30. *Trifolium pratense*, L.
31. *Trifolium repens*, L.
32. *Vicia Cracca*, L.

XII. Rosaceæ.

33. *Amelanchier alnifolia*, Nutt.
34. *Amelanchier Canadensis*, L.
35. *Aronia nigra*, Britton.
36. *Crataegus oxyacantha*, L.
37. *Fragaria Virginiana*, Mill.
38. *Potentilla Anserina*, L.
39. *P. Canadensis*, L.
40. *P. Monspeliensis*, L.
41. *P. tridentata*, Soland.
42. *Prunus Pennsylvanica*, L.
43. *Rosa humilis lucida*, Best.
44. *Rubus Americanus*, (Pers.) Britton.
45. *R. Canadensis*, L.
46. *R. Chamaemorus*, L.
47. *R. hispidus*, L.
48. *R. strigosus*, Michx.
49. *R. villosus*, Ait.
50. *R. villosus frondosus*, Bigel.
51. *Sorbus Americana*, Marsh.
52. *S. sambucifolia*, Roem.

SESSIONAL PAPER No. 22a

XIII. Saxifragaceæ.

53. *Ribes oxyacanthoides*, L.
54. *R. prostratum*, L'Her.

XIV. Crassulaceæ.

55. *Sedum roseum*, (L.) Scop.

XV. Droseraceæ.

56. *Drosera intermedia*, Hayne.
57. *D. rotundifolia*, L.

XVI. Onagraceæ.

58. *Chamaenerion angustifolium*, Scop.
59. *Circæa alpina*, L.
60. *Epilobium lineare*, Muhl.

XVII. Umbelliferæ.

61. *Ligusticum Scoticum*, L.

XVIII. Araliaceæ.

62. *Aralia hispida*, Vent.
63. *A. nudicaulis*, L.

XIX. Cornaceæ.

64. *Cornus Canadensis*, L.

XX. Caprifoliaceæ.

65. *Diervilla Diervilla*, (L.) McM.
66. *Linnæa borealis*, L.
67. *Viburnum cassinoides*, L.

XXI. Rubiaceæ.

68. *Galium tinctorium Labradoricum*, Weigand.
69. *Mitchella repens*, L.

XXII. Compositæ.

70. *Achillea Millefolium*, L.
71. *A. Ptarmica*, L.
72. *Ambrosia artemisiæfolia*, L.
73. *Anaphalis margaritacea*, Benth. and Hook.
74. *Anthemis Cotula*, L.
75. *Aster acuminatus*, Michx.
76. *A. nemoralis*, Ait.
77. *A. Radula*, Ait.
78. *Carduus arvensis*, (L.) Rob.
79. *C. lanceolatus*, L.
80. *Chrysanthemum Leucanthemum*, L.
81. *Doellingeria umbellata*, Nees.
82. *Euthamia graminifolia*, Nutt.
83. *Gnaphalium uliginosum*, L.
84. *Leontodon autumnale*, L.
85. *Nabalus albus*, (L.) Hook.
86. *N. trifoliolatus*, Cass.

XXII. *Compositæ*—Concluded.

- 87. *Senecio Jacobæa*, L.
- 88. *S. vulgaris*, L.
- 89. *Solidago juncea*, Ait.
- 90. *S. neglecta*, Torr. and Gray.
- 91. *S. puberula*, Nutt.
- 92. *S. Purshii*, Porter.
- 93. *S. rugosa*, Mill.
- 94. *Taraxacum Taraxæum*, Karst.

XXIII. *Lobeliaceæ*.

- 95. *Lobelia Dortmanna*, L.

XXIV. *Campanulaceæ*.

- 96. *Campanula rotundifolia*, L.

XXV. *Ericaceæ*.

- 97. *Chamædaphne calyculata*, (L.) Moench.
- 98. *Chiogenes hispidula*, (L.) Torr. and Gray.
- 99. *Gaultheria procumbens*, L.
- 100. *Gaylussacia dumosa*, (Andr.) T. and G.
- 101. *G. resinosa*, (Ait.) Torr. and Gray.
- 102. *Kalmia angustifolia*, L.
- 103. *Ledum Groenlandicum*, Eder.
- 104. *Moneses uniflora*, (L.) Gray.
- 105. *Monotropa uniflora*, L.
- 106. *Oxycoccus macrocarpus*, Pers.
- 107. *O. Oxycoccus*, (L.) MacM.
- 108. *Pyrola secunda pumila*, Paine.
- 109. *Rhodora Canadensis*, L.
- 110. *Vaccinium Canadense*, Richards.
- 111. *V. Pennsylvanicum*, Lam.
- 112. *V. Vitis-Idæa*, L.

XXVI. *Primulaceæ*.

- 113. *Glaux maritima*, L.
- 114. *Lysimachia terrestris*, (L.) B.S.P.
- 115. *Trientalis Americana*, Pursh.

XXVII. *Gentianaceæ*.

- 116. *Limnanthemum lacunosum*, Griesbach.

XXVIII. *Borraginaceæ*.

- 117. *Pneumaria maritima*, (L.) Hill.

XXIX. *Solanaceæ*.

- 118. *Solanum Dulcamara*, L.

XXX. *Scrophulariaceæ*.

- 119. *Chelone glabra*, L.
- 120. *Euphrasia Americana*, Wettst, var. *Canadensis*, (Townsend) Robinson.
- 121. *Melampyrum lineare*, Lam.
- 122. *Rhinanthus Crista-Galli*, L.
- 123. *Veronica serpyllifolia*, L.

SESSIONAL PAPER No. 22a

XXXI. *Lentibulariaceæ*.

124. *Utricularia cornuta*, Michx.

XXXII. *Labiataæ*.

125. *Galeopsis Tetrahit*, L.
126. *Lycopus Virginicus*, L.
127. *Prunella vulgaris*, L.
128. *Scutellaria galericulata*, L.

XXXIII. *Plantaginaceæ*.

129. *Plantago major*, L.
130. *P. maritima*, L.

XXXIV. *Chenopodiaceæ*.

131. *Atriplex hastata*, L.
132. *Dondia maritima*, (L.) Druce.
133. *Salicornia herbacea*, L.
134. *Salsola Kali*, L.

XXXV. *Polygonaceæ*.

135. *Polygonum aviculare*, L.
136. *P. Hydropiper*, L.
137. *P. Persicaria*, L.
138. *P. sagittatum*, L.
139. *Rumex acetosella*, L.
140. *R. occidentalis*, S. Watson.

XXXVI. *Euphorbiaceæ*.

142. *Euphorbia Cyparissias*, L.

XXXVII. *Myricaceæ*.

142. *Comptonia peregrina*, (L.) Coulter.
143. *Myrica Carolinensis*, Mill.
144. *M. Gale*, L.

XXXVIII. *Cupuliferæ*.

145. *Alnus crispa*, (Ait.) Pursh.
146. *A. incana*, Willd.
147. *Betula papyrifera*, Marsh.

XXXIX. *Salicaceæ*.

148. *Populus tremuloides*, Michx.
149. *Salix Bebbiana*, Sarg.
150. *S. fragilis*, L.
151. *S. viminalis*, L.

XL. *Empetraceæ*

152. *Empetrum nigrum*, L.

XLI. Coniferæ.

- 153. *Abies balsamea*, (L.) Mill.
- 154. *Juniperus nana*, Willd.
- 155. *Larix laricina*, Koch.
- 156. *Picea Mariana*, (Mill.) B.S.P.
- 157. *Pinus divaricata*, (Ait.) Sudev.
- 158. *Taxus minor*, (Michx.) Britton.

XLII. Orchidaceæ.

- 159. *Arethusa bulbosa*, L.
- 160. *Gyrostachys gracilis*, Bigel.
- 161. *G. Romanzoffiana*, Cham.
- 162. *Habenaria blephariglottis*, Willd.
- 163. *H. clavellata*, (Michx.).
- 164. *H. obtusata*, (Pursh.) Richards.
- 165. *Limodorum tuberosum*, L.

XLIII. Iridaceæ.

- 166. *Iris Hookeri*, Penny.
- 167. *I. versicolor*, L.
- 168. *Sisyrinchium angustifolium*, Mill.

XLIV. Liliaceæ.

- 169. *Clintonia borealis*, (Ait.)
- 170. *Unifolium Canadense*, Greene.
- 171. *Vagnera trifolia*, (L.) Morong.

XLV. Juncaceæ.

- 172. *Juncus Balticus*, Willd.
- 173. *J. bufonius*, L.
- 174. *J. Canadensis brevicaudatus*, Engl.
- 175. *J. effusus*, L.
- 176. *J. pelocarpus*, E. Meyer.
- 177. *J. tenuis*, Willd.
- 178. *Juncoides campestre*, (L.)
- 179. *J. pilosum*, (L.).

XLVI. Typhaceæ.

- 180. *Sparganium androcladum*, (Engelm.) Morong.
- 181. *S. simplex*, Huds.

XLVII. Naiadaceæ.

- 182. *Triglochin maritima*, L.
- 183. *Zostera marina*, L.

XLVIII. Eriocaulæ.

- 184. *Eriocaulon septangulare*, With.

SESSIONAL PAPER No. 22a

XLIX. *Cyperaceæ*.

185. *Carex abacta*, Bailey.
186. *C. aquatilis*, Wahl.
187. *C. Atlantica*, Bailey.
188. *C. canescens*, L. var. *disjuncta*, Fernald.
189. *C. crinita*, Lam.
190. *C. deflexa*, Hornem.
191. *C. echinata excelsior*, Fernald.
192. *C. exilis*, Dewey.
193. *C. Goodenovii*, J. Gay.
194. *C. leptalea*, Wahl.
195. *C. Magellanica*, L.
196. *C. maritima*, Muller.
197. *C. pauciflora*, Lightf.
198. *C. scoparia*, Schk.
199. *C. scoparia*, var. *moniliformis*, Tuck.
200. *C. sterilis*, Willd.
201. *C. sterilis cephalantha*, Bailey.
202. *C. stricta*, Lam.
203. *C. tenera*, Dewey.
204. *C. tenuis*, Rudge.
205. *C. tribuloides*, Wahl.
206. *C. trisperma*, Dewey.
207. *Eleocharis acicularis*, (L.)
208. *E. tenuis*, Willd.
209. *Eriophorum alpinum*, L.
210. *E. vaginatum*, L.
211. *E. virginicum*, L.
212. *Rhynchospora alba*, (L.)
213. *Scirpus cæspitosus*, L.
214. *S. cyperinus*, (L.) Kunth.
215. *S. lacustris*, L.

L. *Gramineæ*.

216. *Agropyron repens*, (L.) Beauv.
217. *Agrostis alba*, L.
218. *A. hyemalis*, (Walt.) B.S.P.
219. *Alopecurus geniculatus*, L.
220. *A. pratensis*, L.
221. *Ammophila arenaria*, (L.) Link.
222. *Anthoxanthum odoratum*, L.
223. *Calamagrostis Canadensis*, (Michx.) Beauv.
224. *Danthonia spicata*, (L.) Beauv.
225. *Deschampsia flexuosa*, (L.) Trin.
226. *Elymus arenarius*, L.
227. *Festuca ovina duriuscula*, (L.)
228. *Hordeum jubatum*, L.
229. *Phleum pratense*, L.
230. *Poa annua*, L.
231. *P. flava*, L.
232. *P. pratensis*, L.
233. *Panicularia Canadensis*, (Michx.) Kuntze.
234. *Spartina glabra*, Muhl.
235. *S. patens*, (Ait.) Muhl.

LI. Equisetaceæ.

236. *Equisetum arvense*, L.

LII. Filices.

237. *Dicksonia punctilobula*, Gray.
238. *Dryopteris Noveboracensis*, Gray.
239. *D. spinulosa*, (Ketz) Kuntze.
240. *D. intermedia*, (Muhl.) Underw.
241. *Osmunda cinnamomea*, L.
242. *O. regalis*, L.
243. *Pteris aquilina*, L.

LIII. Lycopodiaceæ.

244. *Lycopodium obscurum*, L.

LIV. Hepaticæ.

245. *Marchantia polymorpha*, L.
246. *Ptilidium ciliare*, Nees.

LV. Sphagnaceæ.

247. *Sphagnum acutifolium*, Ehrh.
248. *S. purpureum*, Schiff.
249. *S. cymbifolium*, Ehrh.
250. *S. recurvum pulchrum*, Lind.
251. *S. rubellum*, Wilson.

LVI. Bryaceæ.

252. *Ceratodon purpureus*, Brid.
253. *Climacium dendroides*, Web. and Mohr.
254. *Dicranella heteromalla*, Schimp.
255. *Dicranum majus*, Turn.
256. *D. scoparium*, Hedw.
257. *Fontinalis Dalicarlca*, B. and S.
258. *Leucobryum vulgare*, Hampe.
259. *Polytrichum commune perigoniale*, B. and S.
260. *Racomitrium lanuginosum*, Brid.

LVII. Lichenes.

261. *Alectoria jubata*, L.
262. *Cladonia cornuta*, Fr.
263. *C. cristatella*, Tuck.
264. *C. pyxidata*, (L.)
265. *C. rangiferina alpestris*, L.
266. *Parmelia saxatilis*, L.
267. *Theloschistes parietinus*, (L) Norm.
268. *Umbilicaria Muhlenbergia*, Ach.
269. *U. pustulata papulosa*, Ach.
270. *Usnea barbata*, Fr.

LVII. *Algæ*

271. *Agarum Turneri*, Post. and Rupr.
272. *Ahnfeldtia plicata*, Fries.
273. *Alaria Pylaii*, Grev.
274. *Bangia atropurpurea*, (Dill.) Ag.
275. *Chondrus crispus*, L.
276. *Chorda filum*, Stack.
277. *Chordaria flagelliformis*, Ag.
278. *Cladophora glaucescens*, (Griff.) Harv.
279. *Corallina officinalis*, L.
280. *Enteromorpha intestinalis*, Link.
281. *Fucus nodosus*, L.
282. *F. vesiculosus*, L.
283. *Laminaria dermatodea*, De la Pyl.
284. *L. digitata*, Lam.
285. *L. longicruris*, L.
286. *L. lorea*, Bory.
287. *L. saccharina*, Lamour.
288. *Mastigonema aerugineum*, Kirch.
289. *Oscillaria*.
290. *Ptilota plumosa*, Ag.
291. *Polysiphonia formosa*, Ag.
292. *P. urceolata*, (Dillw.) Grev.
293. *Protococcus viridis*, Ag.
294. *Rhodophyllis veprecula*, J. Ag.
295. *Rhodymenia palmata*, Grev.
296. *Scenedesmus caudatus*, Corda.
297. *S. obtusus*, Meyen.
298. *Ulva latissima*, L.

On August 20 (1901), the writer spent a few hours at Arichat, C.B., and collected specimens of the following plants:—

1. *Arctium minus*, Schk.
2. *Aster junceus*, Ait.
3. *A. lateriflorus*, (L.) Britton.
4. *A. Radula*, Ait.
5. *Callitriche palustris*, L.
6. *Carex flava*, L.
7. *Drosera intermedia*, Hayne.
8. *Dryopteris spinulosa intermedia*, Eat.
9. *Eriophorum gracile*, Kock.
10. *E. Virginicum*, L.
11. *Eupatorium perfoliatum*, L.
12. *Fucus vesiculosus*, L.
13. *Funaria hygrometrica*, Silth.
14. *Habenaria clavellata*, (Mich.) Spreng.
15. *Hypnum Crista-Castrensis*, L.
16. *H. cuspidatum*, L.
17. *H. Schreberi*, Willd.
18. *H. splendens*, Hedw.
19. *H. triquetrum*, L.
20. *Juncus effusus*, L.
21. *Lycopodium clavatum*, L.
22. *Phegopteris Phegopteris*, (L.) Underw.

23. *Polygonum sagittatum*, L.
24. *Rhyncospora alba*, (L.) Vahl.
25. *Scirpus nanus*, Spreng.
26. *Sparganium androcladon*, (Engelm.) Morong.
27. *Spiræa tomentosa*, L.
28. *Stachys palustris*, L.
29. *Tanacetum vulgare*, L.

VII

THE SEAWEEDS OF CANSO.

BEING A CONTRIBUTION TO THE STUDY OF EASTERN NOVA SCOTIA ALGÆ

BY C. B. ROBINSON, B.A., PICTOU ACADEMY.

The month of August spent by me at the Marine Biological Station during its second season at Canso (1902) was almost entirely devoted to the determination of the Marine Algæ.

The region was such as to permit the gathering of species having the most varied habitat, deep-water forms being occasionally dredged in great abundance, while *Laminaria* and *Fuci*, with their associates, grew nearly everywhere below and between tide marks. Tide pools of varying range and size were also easily accessible, and the quieter coves and the wharves yielded other forms. My available time, indeed, proved quite too short for a complete investigation of this portion of the flora of the district.

The clear water frequently made it possible to see large patches of algæ growing upon the bottom at depths of about ten fathoms. The results obtained by dredging in these and somewhat deeper places indicated that the bulk of this was composed of *Ptilota pectinata*, acting as host, however, to many hydroids and other small animals, besides several species of red algæ. Of the latter, *Delesseria alata* was much the most frequent, though the plant seen thus in greatest quantity upon any single occasion was *Euthora cristata angustata*. *Rhodophyllis dichotoma* was also obtained several times, and four species of *Callithamnion* occurred, of which *C. Pylaisæi* and *C. Americanum* were the most plentiful. A small form of this genus, also one each of *Ceramium* and *Polysiphonia*, were often found upon the larger algæ and upon hydroids. These were always sterile, and could not be identified. On the stouter portions of *Polysiphonia* two microscopic encrusting species also grew, one *Erythrotrichia ceramicola*, the other may be the European *Actinococcus*.

Odonthalia dentata and *Rhodomela subfusca* were each dredged on a single occasion only.

In deep places under wharves beautiful specimens of *Delesseria sinuosa* could be gathered, and it also was frequently found in the dredge. The corallines were also abundant, and six species of *Polysiphonia* were collected, of which *P. urceolata*, often fruiting, was the most plentiful. The determination of *P. Olneyi* rests upon a few sterile filaments, and may be inaccurate.

But perhaps the most striking fact regarding the red algæ was the comparative scarcity of some of the best known and most widely distributed genera. *Ceramium* was represented by a few filaments; *Chondrus* and *Rhodymenia* were seen but rarely, *Gigartina* only once.

The *Phæophyceæ* constitute much the greater part of the littoral flora, and while not quite equalling the *Floridææ* in the total number of species found, far surpass them in individuals.

Among the *Fuci* were *F. evanescens* and *F. filiformis*, the former washed ashore near the laboratory, the latter gathered in tide pools on Cranberry. *F. serratus*, which rivals *F. vesiculosus* in abundance at Pictou, and which has recently been found on the Cape Breton coast, was carefully watched for, and apparently does not occur.

Chorda filum, everywhere plentiful, grew in great luxuriance in Grassy Cove, the fronds usually exceeding twenty feet in length. *Agarum Turneri* was found in several

6-7 EDWARD VII., A. 1907

localities, *Alaria esculenta* on Cranberry rock only. *Desmarestia viridis* was common both in dredged material and cast up on the shore, *Chordaria flagelliformis* somewhat less so, while *Desmarestia aculeata* was rather rare. *Castagnea virescens* was but once obtained, but the filaments, when examined microscopically, were found to be densely crowded with spores, and very beautiful.

Elachista fucicola was extremely common throughout the month; *Leathesia difformis*, always scarcer, became rare after the first fortnight. A single imperfect specimen of *Chaetopterus plumosa* occurred in plankton.

Ectocarpus was represented by six species and varieties, including *E. Chordaria* and *E. reptans*, the former growing upon *Obelia*, the latter upon *Chorda*. The organism, however, which usually composed the brownish tufts upon the piles of the wharves, was not one of these, but a diatom, *Navicula mollis*, numerous individuals of which were inclosed within tubes of mucilage, thus forming a false filament.

The *Chlorophyceæ* were less carefully studied, and the list is believed to be somewhat incomplete. Six species of *Cladophora* were determined, obtained chiefly from tide pools. A few filaments only were seen of *Chaetomorpha Picquotiana*, though upon one occasion a considerable quantity was found of a plant, which, rather resembling *Cladophora* in general appearance, seemed never to branch, and answered well to the description of *Chaetomorpha longiarticulata*. The filaments were much more slender and less wiry than those of the other species of this genus, and it was probably a *Rhizoclonium*.

The blue-green algæ listed were found as detached filaments, while examining higher forms, no special effort being made to collect them.

It will be noticed that while *Ptilota*, *Euthora*, and *Delesseria sinuosa*, usually considered amongst the most beautiful red algæ of north-eastern America, are common, *Chondrus* and *Rhodomenia*, the more useful genera of this group, are unusually scarce. On the other hand, nearly all the brown algæ of commercial importance may be had in considerable quantities.

Prof. Farlow very kindly named for me some species about which I was in doubt, and to him and to all of the gentlemen with whom I had the privilege of working at the station, my most grateful thanks are due for assistance and helpful suggestions.

The following is a detailed list of the species observed:—

SCHIZOPHYTA.

SCHIZOPHYCEÆ (CYANOPHYCEÆ).

Hormogoneæ.

Oscillatoriaceæ.

Spirulina sp.

Oscillatoria subuliformis Harv.

O. subtorulosa (Bréb.) Farlow.

O. sp.

Nostocaceæ.

Sphærozyga Carmichaelii Harv.

Rivulariaceæ.

Calothrix confervicola Ag.

C. crustacea (Schousb.) Born. Thur.

SESSIONAL PAPER No. 22a

CHLOROPHYCEÆ.

CONFEROIDEÆ.

Ulvaceæ.

Ulva Lactuca L.

U. Lactuca latissima (L.) DC.

Enteromorpha intestinalis (L.) Link.

E. Linza (L.) J. G. Agardh.

E. Hopkirkii McCalla.

Ulothrichaceæ.

Ulothrix, sp.

Cladophoraceæ.

Chætomorpha Picquotiana (Mont.) Kütz.

Rhizoclonium sp.

Cladophora areta (Dillw.) Kütz.

C. rupestris (L.) Kütz.

C. refracta (Roth) Aresch.

C. glaucescens (Griff.) Harv.

C. lætevirens (Dillw.) Harv.

C. gracilis (Griff.) Kütz.

PHÆOPHYCEÆ.

PHÆOSPOREÆ.

Ectocarpaceæ.

Ectocarpus Chordariæ Farlow.

E. reptans Crouan.

E. confervoides (Roth) Le Jolis.

E. siliculosus (Dillw.) Lyngb.

E. fasciculatus Harv.

E. littoralis robustus Farlow.

Sphacelariaceæ.

Chætopteris plumosa (Lyngb.) Kütz.

Enceliaceæ.

Scytosiphon lomentarius Ag.

Desmarestiaceæ.

Desmarestia aculeata Lamx.

D. viridis Lamx.

Elachistaceæ.

Elachista fucicola Fries.

Chordariaceæ.

Leathesia difformis (L.) Aresch.

Chordaria flagelliformis Ag.

Castagnea virescens (Carm.) Thuret.

Ralfsiaceæ.

Ralfsia verrucosa Aresch.

Laminariaceæ.

Chorda filum, L.

Laminaria longicuris De la Pyl.

L. saccharina (L.) Lamx.

L. saccharina phyllitis Le Jol.

L. digitata (Turn.) Lamx.

Agarum Turneri (Post & Rupr.).

Alaria esculenta (Lyngb.) Grev.

PHÆOPHYCEÆ—Continued.

CYCLOSPOREÆ.

Fucaceæ.

- Ascophyllum nodosum Le Jolis.
- Fucus vesiculosus L.
- F. evanescens Ag.
- F. filiformis Gmelin.

RHODOPHYCEÆ.

BANGIALES.

Bangiaceæ.

- Erythrotrichia ceramicola (Lyngb.) Aresch.

FLORIDEÆ.

GIGARTINALES.

Gigartinaceæ.

- Ahnfeldtia plicata Fries.
- Gigartina mamillosa Ag.
- Chondrus crispus (L.) Stack.

Rhodophyllidaceæ.

- Rhodophyllis dichotoma Lepch.
- Euthora cristata (L.) J. A. G.

RHODYMENIALES.

Delesseriaceæ.

- Delesseria sinuosa Lamx.
- D. alata Lamx.

Rhodymeniaceæ.

- Rhodymenia palmata (L.) Grev.

Rhodomelaceæ.

- Odonthalia dentata Lyngb.
- Rhodomela subfusca Ag.
- Polysiphonia urceolata (Dillw.) Grev.
- P. Olneyi Harv.
- P. violacea flexicaulis Harv.
- P. variegata Ag.
- P. atrorubescens Grev.
- P. nigrescens affinis Ag.

Ceramiceæ.

- Spermothamnion Turneri variabile Harv.?
- Callithamnion floccosum Ag.
- C. Pylaisæi Mont.
- C. Americanum Harv.
- C. corymbosum (Engl. Bot.) Lyngb.
- Ptilota pectinata (Gunn.) Kjellm.
- Ceramium rubrum proliferum Ag.

CRYPTONEMIALES.

Squamariaceæ.

- Actinococcus, sp.?

Corallinaceæ.

- Corallina officinalis L.
- Lithothamnion Lenormandi (Aresch.) Fosl.
- Phymatolithon sp.

VIII

REPORT ON THE MARINE POLYZOA OF CANSO, N.S.

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The following report embodies the results of about seven weeks' work done at the Marine Biological Station of Canada during July and August, 1902. I collected along the beaches, under wharfs, and on kelp washed on the shore. Some dredging was done in the neighbourhood in from 10-25 fathoms, and one of my best sources was stones, tunicates, sponges, &c., brought up on the trawl of the steamer *Active*, which went out a few miles daily to fish for cod and haddock in 20 to 25 fathoms.

My identification depends almost entirely on Hincks' British Marine Polyzoa, as it, the Challenger Reports and Verrill's Report on Invertebrate Fauna of Vineyard Sound were all the accessible literature at the station on this subject.

FAMILY: ÆTEIDÆ.

Aetea truncata (Landsborough).—A colony intermingled with *Obelia commissuralis* growing on a mussel shell (*Mytilus edulis*) was found under a wharf. It is the branched variety, and is exactly like Hincks' illustration, Plate II., fig. 3, except that the tubular appendage is absent in every case and that it is considerably more branched.

FAMILY: EUCRATIIDÆ.

Gemellaria loricata (Linnæus).—A beautiful, bushy, white tuft, two and one-half inches high, attached to a stone, was taken by the trawler *Active*. There is a tinge of brown on the larger branches, but the greater part is pure white; the pits on the wall are extremely small. I have also seen the brown form in about 20 fathoms. In the form and proportion of parts it answers completely to *G. willisii*, Dawson, as described in Hincks' British Marine Polyzoa, p. 21.

Scruparia clavata, Hincks.—Branches on mussel shells (*Mytilus edulis*) were found under wharfs. Some in single file, some back to back, are found in the same branch.

FAMILY: CELLULARIIDÆ.

Menipea ternata (Ellis and Solander).—The following are my notes on this species: July 20, a small patch found on an ascidian taken at Canso. I find no trace of anterior avicularia; lateral avicularia are very distinct, and there is always a large spine on the peristome just inside this avicularium. The operculum varies a good deal in size and shape, and in many is crenate on the free margin, having two or three rounded teeth; it has a thickened border surrounding a deep, flat centre; the tendrils are very long. August 1, specimens were taken from a stone taken by the trawler *Active* in Chedabucto Bay, in about 12-20 fathoms. There is no grouping in triplets, but about seven zoæcia occupy each internode; the anterior avicularium is quite distinct on the upper zoæcium of each internode, and also on some others. The lateral avicularia are not so prominent as in Hincks' illustrations. The operculum covers the greater part of the orifice, and is marked on the front surface. August 19, a tangle of this species mixed with an

6-7 EDWARD VII., A. 1907

hydroid was dredged in 20 fathoms. It answers in every respect to the one of August the first. The median avicularium is present on most of the cells, and some of them are of good size. Spines vary from one to three, and toward the upper part of the colony they are very long.

Scrupocellaria elliptica (Reuss).—A branch of this species about two centimetres high was taken from a stone brought up by a trawl from 30 to 50 fathoms. It is twice dichotomously branched; the vibracula are very long and serrated on one margin; the spines above the orifice vary greatly in length, and many are very long.

Caberea ellisii (Fleming).—This species is common. It was dredged in 30 to 50 fathoms, attached to a sponge and to *Terebratulina septentrionalis*; considerable quantities of it were also dredged in 20 fathoms attached to Balanus, stones, &c.

FAMILY: BICELLARIIDÆ.

Bugula sp.—One specimen about one inch in length was found on a mussel shell (*Mytilus edulis*) taken just below low water under a wharf at Canso. The zoarium is ascending, racemose, regularly dichotomously branched, the branches being rather narrow, and composed regularly of two series of zoecia alternate with each other. The zoecia are long, slightly tapering toward the base, and have at the upper part of the orifice five spines. The largest spine is at the upper outer corner; right in front of the larger spine is another one; a pair of spines, one on each side of the peristome, arise just below the other spines and almost or quite overlap each other; the lower inner spine sometimes absent; the orifice is very large, occupying almost the whole front of the zoecium. Avicularia are entirely marginal in the form of bird's heads. They are pedunculated, and one is attached to the outer margin of each zoecium considerably above the middle; they are stout, being about two-thirds as broad as long, and have both beaks hooked; they are attached by a disk-like base; the oecia are almost globular, flattish at the lower end; they are raised, and attached by a narrow neck to the zoecium below. On one polypide I counted twelve tentacles, on another thirteen. This species differs from *B. avicularia* in the form of the zoarium, the number of spines, in the fact that the avicularia are not elongated but quite stout, and in the number of tentacles.

FAMILY: MEMBRANIPORIDÆ.

Membranipora pilosa (Linnæus).—This is found very commonly about Canso in depths of 10-15 fathoms. I found it on fronds of *Rhodymenia palmata*, *Ptilota plumosa*, and on the stipes of *Laminaria longicuris* washed up on the beach. It sometimes forms narrow patches one inch long and two to four cells wide on *Rhodymenia*, and in this case the basal spine is aborted, but the peristome is surrounded by about five rather short spines directed toward the centre of the peristome. Another peculiarity of this specimen is that on each side of the peristome there is an elliptical, transparent patch about one-fourth the diameter of the peristome. On *Laminaria* it forms encrusting masses, covering frequently the whole stipe. In these the basal spine is present but very short, and the marginal spines are often reduced to two lateral ones near the upper edge of the peristome. The peristome is very large, about one and one-half times the length of the tube below it. Specimens got on *Rhodymenia* and *Ptilota*, near Cranberry Light, in 15 fathoms, formed white encrusting masses, and had typical structure with very long basal spines.

Membranipora lineata (Linnæus).—Small patches were found quite frequently on *Laminaria* just below tide-mark. They are quite normal, except that some have as many as fourteen spines. A beautiful lace-like colony, two inches long, was found on a mussel shell. Every cell had a very prominent avicularium just below its orifice, which is raised greatly, and has its acute mandible never pointing down but always

SESSIONAL PAPER No. 22a

obliquely upward. Generally only one pair of spines is present, and these are erect and situated near the top of the orifice.

FAMILY: CRIBRILINIDÆ

Cribrilina punctata (Hassall)?—I found two specimens, the identity of the first of which I am not sure. The first specimen was found encrusting a shell of *Litorina* which was inhabited by a hermit crab. The boundaries of the cells of the zoarium are not distinct; the whole front of the zoecium is perforated with punctures of large size, giving it a reticulated appearance; the peristome is not greatly thickened on the lower edge, and bears no mucro; it has two spines on the upper margin that are directed inwards. The avicularia are generally absent, but an occasional one is seen on the edge of the peristome. The oœcia are large, covered with punctures, and contain ova of a beautiful pink colour. The second specimen was found on a stone at low-water mark. The two lateral avicularia are present on almost every cell. The spines on the peristome are rather irregular in number, some cells having none, some two. The lower border of the peristome is very slightly thickened, but the mucro is absent.

Cribrilina annulata (Fabricius).—Several very small patches were found on a stone between tide-marks, and a small patch 5 mm. in diameter, together with several other small patches, consisting of from one to three cells, was obtained from the frond of *Rhodymenia palmata* dredged in 20 fathoms, near the entrance to Canso harbour. All the specimens are of a pure white colour. In the larger patch on *Rhodymenia* the marginal zoœcia retain a pair of transparent spots laterally, also two above the orifice.

FAMILY: MYRIOZOIDÆ.

Schizoporella sinuosa (Busk).—A very old, encrusting mass was found on a stone taken by the trawler *Active*. The individuals can be distinguished by the naked eye. The orifice is orbicular, produced into an angle below. The wall is punctured, especially near the edge, where the punctures are large.

Schizoporella hyalina (Linnæus).—This species is very common about Canso. I have found it on *Laminaria longicruris*, *Fucus vesiculosus*, *Ascophyllum nodosum* and a red alga. In all cases it was found in very shallow water or just below tide-mark. The lateral denticles vary a good deal in size, sometimes being very conspicuous when the ventral sinus is deep, or very small when the ventral sinus is shallow.

FAMILYS ESCHARIDÆ.

Lepralia pallasiana (Moll).—A colony was found on a stone taken from under a wharf. There is no umbo, avicularia nor oœcia present; the reticulation is very pronounced and beautiful, the margin of the peristome is not greatly raised and its lower margin is more strongly curved than is indicated in Hincks' drawings.

Lepralia pertusa (Esper).—Specimens were found encrusting an ascidian dredged by the trawler *Active*. As I am not at all sure of the identity of this specimen, I shall give my notes in full. July 15: Zoarium encrusting of a white colour in several small patches. Zoœcia are very distinct, separated by raised lines, and form radiating rows; they are mostly rectangular, a few having a pointed base; a very distinct line of large pores at each lateral edge border the dividing, raised lines; these pores are separated by ridges passing inward radially for a short distance; the orifice is transversely elliptical with a distinct sinus on the lower side; just below the lower lip is a raised, conical or tubular structure with an opening circular above, but prolonged into an angle below; this structure does not come out straight but runs obliquely toward the orifice, no avicularia are present. Every feature is very distinct. July 27: Another specimen taken which is younger. It has an orange appearance and the walls

6-7 EDWARD VII., A. 1907

are translucent; the zoëcia are rather less regular in shape but are arranged in regular lines.

Porella concinna (Busk).—One specimen was got from a stone taken by the trawler *Active*. The wall is thickly punctured, the cells are not distinctly divided, the cell-wall is much raised about the orifice; the avicularia are generally present on the lower lip.

Escharoides rosacea (Busk).—A single specimen 5·6 mm. high divided into two lobes was taken by the trawler *Active* in about 30 to 50 fathoms; it was attached to a stone.

Mucronella sp.—The specimen was found on an ascidian taken by the trawler *Active*. It resembles closely *M. coccinea*. It is an encrusting form; the zoëcia are ovoid, narrowing below, quite flat, the outline of each is very distinct, the surface plainly granular; the orifice is almost terminal, it is rounded above and widest near the base; there are two lateral denticles near the base and a median, blunt denticle on the lower lip; two avicularia are present at the sides of the orifice, their lower edge is below the edge of the lower lip of the peristome; they point upward or inward or between the two positions; there are generally three spines present just above the orifice; the zoëcium is yellowish and dim toward the base. In a second specimen got from a stone taken by trawler *Active*, each zoëcium was punctured around the border very close to the raised, separating ridge. Avicularia are constantly present, only a few having a single avicularium.

FAMILY: CRISIIDÆ.

Crisia eburnea—(Linnæus).—Specimens of this were found on the base of red algæ dredged in 20 fathoms; two small tufts, 1 cm. high from base of stem of *Boltenia*; several branches 2·5 cm. high from stone obtained in Chedabucto Bay; from a hydroid dredged in 20 fathoms at the entrance to Canso harbour; one small branch found attached to *Lafæa dumosa* dredged in 20 fathoms near Canso harbour; a magnificent branch 2·5 cm. high found growing on *Rhodymenia palmata* dredged in 20 fathoms. The joints are always horn-coloured, branches generally do not arise from lowest zoëcium of the internodes but more frequently from the second, third, fourth or fifth. In one specimen oëcia are present. They are always at the base of the branch and are very ventricose with orifice not projecting nor tubular, but transversely narrow elliptical.

FAMILY: TUBULIPORIDÆ.

Tubulipora flabellaris (Fabricius).—Colonies were found on *Laminaria* dredged in 10 to 15 fathoms. The young colonies are fan-shaped, the adult are almost orbicular; there is no sign of lobation in either young or adult.

Idmonea atlantica (E. Forbes).—One colony 2·5 cm. long was got on a muddy bottom in 25-35 fathoms. The branching is fairly regularly dichotomous. There were no oëcia present. Another colony 75 cm. high growing on *Lafæa dumosa* was got in the same locality.

Idmonea serpens, Linnæus.—Two small branches were found in an hydroid dredged in about 20 fathoms near the entrance to Canso harbour. Its colour is ivory white with no tinge of purple.

Entalophora clavata (Busk).—A small, erect colony less than 1 cm. high was found growing on an hydroid dredged at 20 fathoms. It sprang from the same base as a branch of *Idmonea*. It is unbranched but clavate at the end and resembles completely in form Hincks' illustration, Plate LXV., 8d. (Br. Mar. Polyzoa).

SESSIONAL PAPER No. 22a

FAMILY: LICHENOPORIDÆ.

Lichenopora, sp.—I was unable to identify this specimen with any species described by Hincks in 'British Marine Polyzoa.' One small colony was taken off *Rhodymenia palmata* dredged in 20 fathoms near the entrance to Canso Harbour. The specimen is not more than 2 mm. in diameter. The zoarium is stipitate widening above into a shallow cup. There is a wide bordering lamina entirely free and curved up so as to make the edges of the cup. Zoœcia are arranged irregularly with the intervening cavities, also arranged irregularly; many of the orifices have long acuminate projections, some of which are bifid. The characteristic feature of the specimen is the form of the zoarium.

Lichenopora verrucaria (Fabricius).—This is a common species at Canso. I found it on *Laminaria* fronds washed up on the beach, on a blade of dead *Zostera* that came up in the dredge from 30 to 40 fathoms and several colonies on *Ptilota plumosa* dredged from 15 fathoms.

FAMILY: FLUSTRELLIDÆ.

Flustrella hispida (Fabricius).—This is very commonly found between tide marks coating the stems of *Ascophyllum nodosum*. It is always situated at the base of the stipe.

FAMILY: VESICULARIIDÆ.

Bowerbankia, sp.—Specimens were found growing on hydroids attached to mussel shells taken under wharfs. The zoœcia are in groups attached to both sides of a jointed stolon. The polypide has eight tentacles, the stomach is quite dark coloured, the gizzard conspicuous and many cells contain rounded, dark brown bodies.

Bowerbankia imbricata (Adams).—A small mass was found growing on the surface of *Membranipora lineata* attached to a mussel shell. The majority of the polypides have a large, red, oval larva in each, and this is the only distinct organ that can be seen. One had its tentacles projecting in a long, pointed mass, they seem to be more than ten, but I could not tell the exact number. I am not at all sure of the identity of this specimen.

FAMILY: PEDICELLINIDÆ.

Pedicellina cernua (Pallas).—Both the smooth and spiny variety of this species occurred on mussel shells taken under wharfs. Variety *glabra* is the more common, only one specimen of the spiny form was found and the spines on this were long and hair-like, and were not confined to the peduncle, but also cover the polypides. I counted fourteen tentacles in several individuals.

Pedicellina nutans, Dalyell.—This was found intermingled with *Bowerbankia*, sp. on a mussel shell got from under a wharf, and also mixed with *Pedicellina nutans* growing on *Membranipora lineata* got from a mussel shell.

Pedicellina gracilis, Sars.—One specimen of this species was found spread over an encrusting mass of *Membranipora lineata* on a mussel shell, which was got under a wharf, it was intermingled with *Pedicellina nutans*, and the cells of the two were about the same size. The peduncle was very long and slender, the expanded, cylindrical part at the base being hardly one-eighth of the whole peduncle, but in a few cases as much as one-fourth. In some individuals the peduncle expands above to form a capitate head which contracts suddenly at the polypide. The polypides are plainly gibbous on the sides. The stolon is jointed.

6-7 EDWARD VII., A. 1907

FAMILY: LOXOSOMIDÆ.

Loxosoma singulare, Keferstein.—Two specimens were found on *Schizoporella*. Both have two buds of different sizes on each side. The stalk is about one-half the length of the body, transversely marked, but the expanded disk below is hid from sight. It only varies from Hinck's description by having eight tentacles in one specimen. The number in the other could not be counted.

Unidentified.—A specimen was found on a stone taken by the trawler *Active*. It formed a very small, white, encrusting mass; the zoœcia are arranged in very irregular order and their boundaries are not distinct; the orifice is arched above and convex below, due to a tubercle arising just below the orifice; this tubercle has two lateral wing-like outgrowths below and in this way forms a crescent-shaped body on the front surface of the zoœcium; dim radial lines pass out from this to the margin; two spines arise from the upper side of the orifice. Many have globular oœcia above, and on these the spines are absent.

Another species was found on a stone and on the shell of *Balanus* taken by trawl of the *Active*. The zoarium is encrusting and of a greenish colour; zoœcia are of average size, very plainly marked off from one another and of irregular and various shapes, the whole surface is flat and covered with very large punctures giving it a reticulated appearance. The orifice is not terminal but at the upper end, not projecting, and almost perfectly orbicular; some have two lateral denticles near the lower edge; directly below the orifice is an avicularium with pointed mandible running nearly horizontal, or obliquely upward.

IX

NOTES ON THE FISHES OF CANSO.

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The following notes refer to specimens of fishes collected and determined at the Marine Biological Station during July and August in the two seasons of 1901 and 1902. In nomenclature and classification Drs. Jordan and Evermann's 'Fishes of North and Middle America' has provided the authority followed. The specimens, it may be added, were collected mainly during the trips of the fishing steamer *Active*, operated by the Messrs. Whitman, of Canso, or were obtained along the shore, or in shallow water about the wharfs of the harbour, or in the areas thickly overgrown with eel-grass, adjacent to the laboratory. I visited several times each week the traps set for mackerel and squid in water about six fathoms in depth quite close to the land. The *Active* furnished most specimens, secured during her daily fishing trips, a few miles from the harbour, where trawls of hooks were set for cod and haddock. For about a month during 1901 the beam-trawl was used in Chedabucto Bay at a depth of 18 to 20 fathoms, with most noteworthy success. A few fish were kindly brought by some of the local fishermen from the 'Banks' and by some of the deep-sea fishermen who fish in small boats with handlines or with long lines of hooks known as 'trawls.' I cannot refrain from making special reference to the willing aid of Mr. C. H. Whitman, who most kindly compiled statistics regarding the local 'takes' of certain fishes of which I have made use, as well as for much other assistance during the whole course of the work of collecting specimens.

FAMILY: GALEIDÆ.

1. *Prionace glauca* (Linnæus).—This species, called in the locality of Canso the 'Blue Dog,' is very common in the adjacent waters, and is reported by the cod fishermen to be extremely plentiful on the 'Banks.' Two specimens which I measured were 1,423 mm. and 1,437 mm. respectively from the tip of the snout to the concavity of the tail. In one there were three gills upon one side atrophied. They are stated to die upon the trawl hook more quickly than the cod or the picked dog-fish (*Squalus acanthias*), so that they are rarely brought on deck alive. The fishermen think that when they take the hook they are unable to close the mouth, and thus drown. I have seen one come to the surface when out fishing with the hook trawl, and after it had snapped off a cod-fish from the trawl it would circle round, with its dorsal fin exposed, and rapidly gather up the fragments, an occurrence which I am informed is very common on the fishing grounds. An examination of the stomach showed a few shrimps only, and in the longitudinal spiral valve were many specimens of a tape-worm.

FAMILY: SQUALIDÆ.

2. *Squalus acanthias*, Linnæus.—This is an extremely common species, and often a great nuisance to the fishermen fishing with trawls of baited hooks. I have known gear with 700 hooks to have 690 of these dog-fish upon it. No use is generally made of these fish; they are difficult to release from the hooks, and they generally snap off

6-7 EDWARD VII., A. 1907

the snood; they are regarded with much disfavour. As Professor Prince pointed out in his report on the 'Dogfish Pest in Canada' (Fisheries Report, Department of Marine and Fisheries, Ottawa, 1903), this species has proved a most destructive enemy to the sea fishermen's pursuits, and his recommendations to the government favouring reduction works for converting dogfish into fertilizer, oil, glue, &c., are now being carried out.

FAMILY: RAIIDÆ.

3. *Raia ocellata*, Mitchill.—A most common species at Canso, though some of the specimens which I examined may belong to the allied species *R. erinacea*. I found it difficult to decide finally in the case of some examples. They were all taken in trap-nets set for mackerel, close along the shore. I give the following details in regard to four specimens:—

Length.	Number of Teeth.	Sex.	Ocelli.
700 mm.....	78 85	Male.....	Not distinct.
689 mm.....	69 77	Female.....	Absent.
715 mm.....	91 90	".....	Present.
610 mm.....	71 73	Male.....	Absent.

The last-named specimen exhibited several rows of spines along the tail, which would indicate that it is *R. ocellata*; but in it and in the second specimen the number of teeth present is intermediate between the diagnostic dentition of the two species. In the two male specimens the double row of erectile spines points inward to the middle line rather than backward. In none of those in which ocelli are present is there any central dark spot. Their food was found to be dollar fish (*Poronotus triacanthus*), the cunner (*Tautoglabrus adspersus*) and squid, remains of which occurred in the contents of the stomach.

4. *Raia lævis* (Mitchell).—This species is frequently captured by the cod fishermen on their deep-sea trawls of hooks. The only specimen minutely examined by me was 1,075 mm. long. In colour it was light-brown dorsally, with scattered dull black spots. There were two large ocelli surrounded by a black ring; ventrally, it exhibited small black spots; some of them were arranged in two rows.

5. *Raia radiata*, Donovan.—This skate or ray is usually called the Starry Ray, and it is the most common species taken on the local cod-trawls. Hence Drs. Jordan and Evermann are not perfectly accurate, so far as eastern Nova Scotia is concerned, in saying that this species is not common on the Atlantic coast. I have seen several dozens taken in about three hours by one dory. Nor are the American authorities accurate as to the size, as I have seen half a dozen amongst an afternoon's catch on board a dory each of which exceeded three feet in length. Two that I measured accurately were 994 mm. and 1,126 mm. long, the former being a female and the latter a male. The fishermen informed me that they secure very frequently specimens of the dimensions just specified. On two small specimens (145 mm. long) taken in the dredge the lateral spines on the tail were quite rudimentary. A large spine was present just

SESSIONAL PAPER No. 22a

behind the spiracle in the specimens examined. In one large specimen I noticed a row of transverse black lines on each side dorsally and running backward almost parallel, but on the tail approaching and becoming obscure.

Of the Teleosteans, or bony fishes, specimens embracing fifty-one species passed under my examination, and in regard to these the following notes were prepared:—

FAMILY: ANGUILLIDÆ.

1. *Anguilla chrysypa*, Rafinesque.—Specimens of the common eel are plentiful in the long eel-grass inshore and in shallow water. They are caught in traps and eel-pots. The young, less than 10 cm. in length, are also found in shallow water near the shore.

FAMILY: CLUPEIDÆ.

2. *Clupea harengus* (Linnæus).—The common herring is not abundant and is not commercially important. A few are taken from the trap-nets, but never more than a barrel or two. They varied in length from 189 mm. to 235 mm.

3. *Pomolobus pseudoharengus* (Wilson).—This species, called locally the Alewife or Gaspereau is taken in small quantities in the trap-nets, but is commercially unimportant.

FAMILY: SALMONIDÆ.

4. *Salmo salar* (Linnæus).—Young specimens about 230 or 250 mm. in length are commonly taken in the early summer, and adults are caught in spring and early summer.

FAMILY: ARGENTIDÆ.

5. *Osmerus mordax* (Mitchell).—The smelt is common, though not found in the vast quantities which occur in the more northern estuaries. It is caught by hook and line from the wharfs, and in the trap-nets. Owing to the limited quantities taken, none are shipped from Canso to the markets as a rule.

FAMILY: PÆCILIIDÆ.

6. *Fundulus heteroclitus* (Linnæus).—The common killifish is plentiful in brackish ponds near the beach at Canso.

FAMILY: SCOMBRESOCIDÆ.

7. *Scombrosox saurus* (Walbaum).—Large schools of this species can often be seen skipping over the water trying to escape from the voracious pollack. A few are caught in the trap-nets, and on one occasion a specimen was washed on board the tug during one of our scientific trips in the bay.

FAMILY: GASTEROSTEIDÆ.

8. *Pygosteus pungitius* (Linnæus).—In one pond near the seashore this small fish is very common; but, curiously enough, it is entirely absent from another pond quite similar in its physical features, and practically adjoining.

9. *Gasterosteus bispinosus* (Walbaum).—This species is abundant in tidal pools and in ponds near the beach. They seem to be of two sizes, with no intermediate links. Those of larger size are 53-60 mm. in length, and are confined to the tidal pools, while

the smaller specimens, 20-26 mm., are found both in the tidal pools and in the brackish water ponds, and in both sizes the genital organs were found to be mature. I made accurate measurements of seven examples, and found that, in three of them, the first dorsal spine does not reach the second, in one the tip just touches the base of the second, and in three it projected beyond the base of the second. The ratio of length to height in the seven are 4·3, 4·1, 3·8, 4·2, 4·3 and 4·9, hence the distinction which has been drawn between *G. spinosus* and *G. aculeatus* does not hold in the case of the Canso specimens. I made some endeavour to decide if other peculiarities could be correlated with the red throat and red fin membrane which many exhibited. Out of 245 specimens collected from the pond, 16 were distinctly red-throated, and 8 red-throated specimens examined were found to be males with active spermatozoa in the testes. Out of 10 with pale throat 5 were females and 5 proved to be males showing active spermatozoa.

10. *Apeltes quadracus* (Mitchell).—This species was common in a brackish pond near the beach. The head I found to be contained 4·3 times in length, and the depth 4·3-4·8 in the length. The anal spine does not come under the third dorsal ray, but under the fourth, fifth or even under the seventh. In a large number the ventral fins have orange-red membranes, and sometimes the membrane of the dorsal and the anal spines are red. All with coloured membranes I ascertained to be males, and seven specimens not so tinted were females. I could detect no external marks of difference in the colouration of males and females excepting the red membranes. The dorsal spines are bent irregularly to the right and left, and in about one-third of the examples obtained the dorsal spines were four in number.

FAMILY: SCOMBRIDÆ.

11. *Scomber scombrus* (Linnæus).—Of this valuable food-fish variable quantities are captured by gill-nets and traps. They are usually shipped fresh to the Canadian markets, the fishermen receiving two to ten cents a piece for them, and the fishing season lasts from May to November. In one season recently over 250,000 mackerel were taken by Canso fishermen.

12. *Thynnus thynnus* (Linnæus).—The mackerel traps often capture specimens of this large species about the end of July and in the month of August. They are often called by the erroneous names, mackerel shark or horse-mackerel, the former being really the porbeagle (*Lamna*) and the latter the scad (*Trachurus*). The name tunny is correct and most appropriate, and in the Mediterranean sea it is one of the principal fisheries pursued, while in Japan it is an esteemed food-fish, raw, salted, smoked and canned in oil. At Canso they are occasionally captured, but one trap in a few weeks took over forty. All were liberated, as there is no market for them. They are often seen swimming near the surface of the sea.

FAMILY: AMMODYTIDÆ.

13. *Ammodytes americanus* (DeKay).—This species was found only at one point at Canso. On a sandy beach at the entrance of a cove connected with Canso harbour they occurred very numerous at low tide. The drag seine used at this place on being hauled in quickly captured many hundreds in a short time. They were often found stranded on the shore as the tide went out, and were also dug out of the sand at a depth of six inches. They appeared to be of two sizes, without intervening stages. Twenty-five of the larger ranged from 157 mm. to 184 mm. in length, and ninety of the smaller type were found to measure 60 mm. to 89 mm. in length. The stomach was often empty; but when filled contained small crustacea, some of which were not secured in the immediate locality, and did not appear to occur locally.

SESSIONAL PAPER No. 22a

FAMILY: XIPHIIDÆ.

14. *Xiphias gladius* (Linnaeus).—This species while not one of the common species captured at Canso, is at times taken in the trap-nets. One was secured in that way in 1901, and one in 1902 came to my notice. A demand has arisen for these fish commercially, and they have a high reputation in the United States markets, and being of large size (200 to 400 pounds being a frequent range of their weight) the fishery might become a remunerative one were it developed.

FAMILY: CARANGIDÆ.

15. *Decapterus macarellus* (Cuv. and Valenc).—Two specimens of this species were caught in the Chedabucto Bay trap-nets. They were wholly unfamiliar to the fishermen, and are apparently rarely seen at Canso.

16. *Trachurops crumenophthalmus* (Bloch)?—Two specimens were taken in the trap-nets by local fishermen, to whom the fish was unknown before. The specimens were found to differ from the description of Drs. Jordan and Evermann in two respects,—there are no scales on the cheeks, and, along the side, a bright golden-yellow band passes longitudinally below the lateral line anteriorly; but about midway it crosses and then passes back above the lateral line.

FAMILY: CENTROLOPHIDÆ.

17. *Palinurichthys perciformis* (Mitchell).—The fishermen call this species the 'Rudder fish,' and are familiar with it, as they state that it follows their sailing vessels into port from the 'Banks.' One specimen was taken by hook at the Canso wharf.

FAMILY: STROMATEIDÆ.

18. *Poronotus triacanthus* (Peck).—This small silvery fish is fairly common, and is frequently captured in the trap-nets.

FAMILY: SERRANIDÆ.

19. *Roccus lineatus* (Bloch).—Young specimens 170 mm. long of this fine fish, which when adult may measure 3 to 5 feet in length and weigh from 20 to 100 pounds, are frequently caught by boys with hook when fishing for smelt.

FAMILY: LABRIDÆ.

20. *Tautogolabrus aaspersus* (Walbaum).—An excessively abundant fish about the wharfs. It is very variable in size and colour, and is popularly known as the perch or cunner.

FAMILY: BALISTIDÆ.

21. *Balistes carolinensis* (Gmelin).—One specimen of this remarkable File-fish was brought in by the deep-set fishermen, who stated that it was 'gaffed' on Banquereau Bank, about fifty miles southeast of Canso. It was seen near the surface swimming around a floating buoy. Its captors had never seen one before, and it may be added that while the members of the family are abundant in tropical seas they become very scarce in higher latitudes.

6-7 EDWARD VII., A. 1907

FAMILY: MOLIDÆ.

22. *Mola mola* (Linnæus).—The sun-fish, as it is called all over the Atlantic waters of Europe and this continent, is not uncommon at Canso and out on the 'Banks.' Specimens even come close to the beach, and one was driven ashore by the fishermen with oars and gaffs, and was brought to the station. Another example was also obtained, and the measurements of each respectively were 1,480 mm. long and 1,780 mm., vertically from the tip of the dorsal to the tip of the anal fin, in the first, and 1,790 mm. long and 2,020 mm. vertical measure, in the second. The stomach of one was empty, while in the other were found two squid.

FAMILY: SCORPÆNIDÆ.

23. *Sebastes marinus* (Linnæus).—A few specimens of this fish called locally 'Red Perch' or 'Gale fish,' or more widely the 'Norway haddock,' are taken on every trawl of hooks, but no use is made of them. They frequent a soft bottom at the base of the slope from shallow to deep water at about 60 fathoms. I found that neither the pectoral nor ventral fins are long enough to reach the anus.

FAMILY: COTTIDÆ.

24. *Triglops pingeli* (Reinhardt).—A specimen swept into the beam-trawl net at 18 fathoms depths in Chedabucto Bay was 78 mm.; and in several respects it differed from the description given by Drs. Jordan and Evermann. The series of spines along the base of the dorsal fin is continued to the caudal fin; but from the middle of the second dorsal fin the spines are small and not obvious. Dorsally it is light greenish-brown, mottled with a light reddish shade of the same colour. There are four dark saddles across the back; an interrupted black line runs along the side; there is no ocellus on the anterior dorsal fin. Each of the dorsal fins exhibits three black lines, while the pectoral fin has four dark bars and the anal fin is white. A distinct dark line runs below the eye on each side of the head.

25. *Myoxocephalus grænlandicus* (Cuv. and Valenciennes).—This species is exceedingly common in shallow water, and shows great variation in colour. It ranges in length from 130 to 170 mm.

26. *Myoxocephalus octodecimspinosus* (Mitchill).—Several specimens were taken in the beam-trawl net in 18 fathoms of water on a sandy bottom in Chedabucto Bay. In one example, 201 mm. long, the soft dorsal fin had a short anterior spine; but possibly this feature was not normal, as in two smaller specimens it was absent. In the same large specimen the preopercular spine does not extend so far as the opercular spine; but this does not apply to the two smaller examples.

27. *Hemitripterus americanus* (Gmelin).—This is a very common fish at Canso, and as a rule called the 'Sculpin.' It occurs at depths of a few feet down to 50 or 60 fathoms, and varies most remarkably in colour; some are bright red, others dark brown, and there are intermediate shades. The brilliant-red specimens generally occur in deep water; but the dark-brown type occurs at all depths. Large specimens are taken, the largest being no less than 511 mm. long. They are used as bait in the lobster traps with other rejected or 'offal' fish.

FAMILY: AGONIDÆ.

28. *Aspidophoroides monopterygius* (Bloch).—The beam-trawl net secured several specimens in Chedabucto Bay at a depth of about 18 fathoms.

SESSIONAL PAPER No. 22a

FAMILY: CYCLOPTERIDÆ.

29. *Cyclopterus lumpus* (Linnæus).—This fish, generally known as the lumpfish, lumpsucker, or in Scotland the 'paidle,' is plentiful at Canso in the spring; but much scarcer in summer. I examined one specimen caught by a fisherman on his baited hook while fishing for pollack. The colour appears to fade very quickly from the slimy skin after death.

FAMILY: BLENNIIDÆ.

30. *Pholis gunnellus* (Linnæus).—This eel-like familiar fish, often called the Gunnel or Butterfish, is very common under stones at low water, and eludes capture by reason of its exceedingly slimy, slippery integument.

31. *Sticthæus punctatus* (Fabricius).—One specimen of this peculiar blenny was found in the beam-trawl net when fishing in 18 fathoms of water in Chedabucto Bay on a sandy bottom. Another was obtained in a moribund condition under a wharf. The markings differ very much from the description of Drs. Jordan and Evermann. There is no tinge of scarlet; but the colour is light-brown above, whitish-yellow below, while black blotches occur dorsally, and eight or nine large irregular brownish blotches on the sides. There are twelve black spots on the anal fin. The blotches on the side are somewhat indistinct in one of the specimens.

32. *Ulvaria subbifurcata* (Strong).—Four specimens of this species were obtained. One was found under some stones on the beach, when looking for gunnel or butterfish, while two were brought up in the dredge in 6 to 10 fathoms of water, and the fourth was taken in the beam-trawl net in the bay in 30 fathoms of water. It would appear, therefore, not to be wholly a deep-water fish, and I may add that there can be no doubt as to my identification of the specimens.

FAMILY: CRYPTACANTHODIDÆ.

33. *Cryptacanthodes maculatus* (Storer).—This rather uncommon fish is taken on the hooks of the haddock-trawls at about 20 fathoms depth. It is often called the Lamper-eel, in common with *Zoarces* the viviparous blenny. All the specimens in my hands were dark in colour; the lateral line was distinct, showing about 140 pores, and the colouring is lighter along this line.

FAMILY: ANARHICHADIDÆ.

34. *Anarhichas latifrons* (Steenstrup and Hallgrímsson).—One very large specimen of the wolf-fish was taken on the trawl of the steamer *Active* in about 50 fathoms. I learned that not more than one or two specimens are secured in a season, so that it is not a common fish. Its length was 1,166 mm., or including the caudal fin to its final margin, 1,240 mm. The shape of the fish differed very much from that given by Drs. Jordan and Evermann, as the abdomen was far more prominent, the vertical depth being contained three times in the length. The mouth for so large a fish seemed small, and the vomerine teeth extended within one centimetre of the posterior palatines. The American authorities referred to are certainly in error in stating as a generic character the presence of an air-bladder. There is no sign of such an organ in this species or in the Sea-cat, *A. lupus*. The dorsal fin is continuous with the caudal fin; but becomes very much narrowed as it approaches the caudal. This fish is of a dark-brown chocolate colour, obscurely mottled. Four sea-urchins, 45 to 60 mm. in diameter, were found intact in the stomach, except that the spines were detached.

35. *Anarhichas lupus* (Linnæus).—This species is common at Canso, and almost every trawl of hooks brings up a few. The local fishermen call it 'Catfish,' as they do

in Britain, and they are loud in its praises as an edible fish, though it is treated as 'offal' fish. I took from the stomach gastropod and lamellibranch shells, hermit crabs, sea-urchins, and the much branched *Astrophyton*.

36. *Anarhichas minor* (Olafsen).—Occasional specimens, differing from the two foregoing species, are occasionally brought in by the fishermen, and appear to belong to this species. Like *A. latifrons* this is usually regarded as a purely Arctic wolf-fish.

FAMILY: ZOARCIDÆ.

37. *Zoarces anguillaris* (Beck).—This species appears to be common at about 20 fathoms depth, and is constantly caught by the trawl hooks or in the beam-trawl net. The usual name for it at Canso is Rock-eel or Lamper-eel. There are great variations in the relative dimensions of the head, pectoral fin and abdomen, and in the thickness of the lips. I noticed that the first ray of the dorsal fin is generally behind the line of the preopercle, and not above it.

38. *Lycodes*, sp.—Three specimens were taken on the trawl-hooks of the steamer *Active* at a depth of about 50 fathoms where the bottom is sandy. The fishermen declare that it is sometimes taken on the 'Banks;' but they appear to have no popular name for it. One man called it the 'Laughing Jack.' It seems to correspond with no species described by Drs. Jordan and Evermann, and I therefore give my notes on the specimens in detail:—

	Specimen No. 1.	Specimen No. 2.
Length.	662 mm.	656 mm.
Head.	166 mm.	160 mm.
Depth.	87 mm.	90 mm.
Width of eye.	22 mm.	18 mm.
Interorbital space.	26 mm.	26 mm.
Snout.	57 mm.	60 mm.
Pectoral fin.	94 mm.	94 mm.
Ventral fin.	14 mm.	15 mm.
Dorsal fin. . . . .	.....	96 rays
Anal fin. . . . .	.....	69 rays
Pectoral fin.	18 rays	18 rays
Upper jaw, length. . . . .	.....	84 mm.
Lower jaw, length. . . . .	.....	54 mm.
Base of ventral to anus. . . . .	.....	166 mm.
Depth at anus. . . . .	.....	75 mm.
Distance between nostrils. . . . .	.....	30 mm.
Distance from eye to nostril. . . . .	.....	38 mm.
Highest dorsal ray. . . . .	.....	39 mm.
Highest anal ray. . . . .	.....	30 mm.

The head is very wide and flat, while the body is compressed and tapers backward to a point. The jaws have very wide flaps, which on the upper jaw project very much. A fold of skin on the chin runs parallel with the edge of the lower mandible and ends in a free laterally compressed flap. The lower jaw is included. The teeth are all conical, and are found on the upper and lower jaws, palatines, and vomer. In the upper jaw there is one row supported at the front by two or three small teeth on a posterior row; the vomerine teeth form a small transverse oval patch; the palatines form a single row on each side diverging posteriorly; in the lower jaw there are three rows for a short distance anteriorly and one row follows posteriorly; the row of maxillary teeth is 35 mm. long, palatines 29 mm., vomerines 9 mm. × 4 mm., mandibular 55 mm. long. The dorsal fin commences about 2 cm. behind the pectoral; the dorsal and anal unite around the caudal; both are highest at the anterior, tapering posteriorly; the ventral fins are conical, almost teat-like. Scales are present on the sides of the body, beginning a little behind the pectoral fin, and are round, cycloid, the

SESSIONAL PAPER No. 22a

largest being about 1 mm. in diameter; they are imbedded in skin, the spaces between them being about two diameters. The dorsal and anal fin are scaly to the free margin behind, but the distal part is naked anteriorly. The head, part of the nape, sides of body for 2 cm. behind the pectorals, the abdomen, pectoral and pelvic fins are scaleless. The ground colour is a greenish-yellow except on the chin, throat and pectoral fins, which are whitish, the latter becoming dusky toward the tips. The sides and top of the head are reticulated with black, passing just in front of the top of the gill-slit; over the top of the head from side to side is a light, conspicuous band of the ground colour bounded at the edges by a wavy, black line; about nine wide, black, transverse bands pass across the sides, and are extended into the dorsal fin, where they are lost; these black bands become less distinct posteriorly, and do not extend to the ventral surface; each band consists of a reticulation of black on a green back-ground. It is quite unlike the reticulations of *L. reticulatus*, as the black is not in narrow lines but in bands of 5 to 10 mm. in width. The dorsal fin is edged with darker, the anal fin has scattered shades of dusky most marked posteriorly. There are indications of the median lateral line on the last 150 mm. of the tail.

FAMILY: GADIDÆ.

39. *Pollachius virens* (Linnaeus).—This is one of the most abundant food-fishes at Canso, 500,000 pounds being the annual catch. It is captured usually with hook and line in the surface waters from June to December. A few, however, are brought up on the hooks of cod-trawls from 30 to 50 fathoms. On being brought to the wharf, the head is removed and the backbone excised. They are then salted and shipped to the West Indies. The fishermen receive from one-half to one cent per pound for their pollack.

40. *Urophycis tenuis* (Mitchill).—This species of hake, commonly called 'Squirrel hake' by the fishermen, is captured occasionally on the cod-trawl hooks on muddy bottoms. One specimen carefully examined by me varied considerably from the description of Drs. Jordan and Evermann, and I therefore detail the measurements: Length, 865 mm.; depth, 215 mm.; orbit, 36 mm.; snout, 63 mm.; inter-orbital space, 58 mm.; length of pectoral fin, 144 mm.; head, 235 mm.; length of filamentous dorsal ray filament, 85 mm.; rays of dorsal fin numbered 11, 54, the rays of the anal fin 50, of the pectoral fin 15, of the ventral fin 4. Twelve rows of scales occurred between the lateral line and the anterior dorsal fin; the number of scales along the lateral line is 130. The head as shown by the examination of several other specimens was found to be contained less than four times in the length, and the depth to be contained less than five times in the length. I may add that the term 'Squirrel hake' may be applied to any small hake.

41. *Enchelyopus cimbrius* (Linnaeus).—Two specimens were secured by the beam-trawl in 30 fathoms of water in Chedabucto Bay.

42. *Gadus callarias* (Linnaeus).—The cod is of course a supremely important fish of Canada. The fishing season extends throughout the year, and about 3,566,000 pounds of this fine food-fish, for which the fishermen receive from $\frac{3}{4}$ to 2 cents per pound, are taken annually. 1,000,000 pounds are salted and dried, 1,000,000 are salted, 1,000,000 pounds are shipped fresh packed in ice, and 500,000 pounds are shipped fresh frozen. The fresh fish supplies the market for Canada, and the salted is disposed of in Canada and the West Indies.

43. *Melanogrammus æglefinus* (Linnaeus).—About 3,000,000 pounds of this fish are taken annually at Canso. 400,000 pounds are smoked and 25,000 pounds are salted; 25,000 pounds are salted and dried, 2,000,000 pounds are shipped fresh packed in ice, and 550,000 pounds are shipped fresh frozen. The fresh and smoked are consumed in Canada, the salted in Canada and the West Indies and the dried in the West Indies.

6-7 EDWARD VII., A. 1907

Fishermen receive one-half to two and a half cents per pound. They are caught throughout the year.

FAMILY: PLEURONECTIDÆ.

44. *Hippoglossus hippoglossus* (Linnæus).—This is a very important food-fish. The size varies from a few pounds to two hundred or even more dressed. They are caught with hook and line and on the trawls. Those with the lower surface white are considered much better than those with a duller colour, and bring a much better price. 300,000 pounds are caught annually, which is shipped fresh to the Canadian market. Fishermen receive from 1 to 10 cents a pound. They are caught throughout the year.

45. *Reinhardtius hippoglossoides* (Walbaum).—This fish is not uncommon at Canso. It is taken on the trawl on muddy bottom in about 50 fathoms or deeper. It is here called the 'Turbot,' and is considered good eating. The anal and dorsal fins are scaled, and the number of canines in upper jaw varies, one having two on right side and three on left; another has two on right side and one on left side.

46. *Hippoglossoides platessoides* (Fabricius).—This is a very common fish on the trawls, and is only occasionally marketed. Very many young specimens from 4 or 5 cm. to 25 cm. long were taken in the beam-trawl at 20 fathoms in Chedabucto Bay. The young specimens have characteristic markings; along the dorsal margin are three distinct large, black, round ocelli, and on the ventral margin are four ocelli; other smaller fainter spots are also seen on the margins.

47. *Limanda ferruginea* (Storer).—A few specimens were got in the beam-trawls from 20 fathoms in Chedabucto Bay.

48. *Pseudopleuronectes americanus* (Walbaum).—This is the common flat fish of shallow water. It is seen under wharfs, in eel-grass, and a few were captured every day in the trap-nets. Many were taken by beam-trawl in 20 fathoms.

49. *Glyptocephalus cynoglossus* (Linnæus).—A few of these were got by the beam-trawl in Chedabucto Bay. The fishermen call it the 'Lemon Sole' or the 'Fluke.'

50. *Lophopsetta maculata* (Mitchell).—One specimen 230 mm. long was got from a thap-net and two or three were got by the beam-trawl in Chedabucto Bay.

FAMILY: LOPHIIDÆ.

51. *Lophius piscatorius* (Linnæus).—This fish is obtained very commonly on the hooks of the long trawls in deep water and at moderate depths.

X

PRELIMINARY REPORT ON THE TREMATODES OF CANADIAN
MARINE FISHES.

BY J. STAFFORD, M.A., PH. D.

(McGill University, Montreal.)

The worms that live parasitically upon the surfaces or in the cavities or tissues of our fishes may be distributed into six groups:—

1. Turbellaria.
2. Trematoda (Sucker worms).
3. Cestoda (Tape worms).
4. Nematoda (Thread worms).
5. Acanthocephala (Hook-headed worms).
6. Hirudinea (Leeches).

Excepting the first, each of these groups is represented by numerous different kinds as will be indicated in this brief account by the enumeration of the species of Trematodes hitherto observed at the biological station, with an appended list of their hosts. The Trematodes are commonly divided into (1) Ectoparasitic Trematodes, or those that live on the skin or gills, and (2) Endoparasitic Trematodes, or those that occupy some internal organ. The first are generally the more active, often possessing such special sense organs as eyes; are well adapted, by flatness of form in the larger species, and especially by the presence of suckers or hooks, to their habit of clinging to the surfaces of their hosts; are most closely affiliated by organization with their nearest relatives among free-living worms; and develop from eggs by a direct and gradual process of growth. The second are generally more quiescent, having no special sense organs; are more completely adapted to life in an internal organ; possess typically two suckers (sometime only one) and no hooks; and develop primarily from eggs, but by a long, often complex series of transformations. The parasite during these transformations lives at one stage in such an animal as a snail (intermediate host), and at a later stage in a fish (final host) which has eaten the snail and in which the worm now comes to full development and produces eggs.

The life-histories of the species catalogued below are not known to me and are matters for future research, but from what is known of others we may anticipate that the eggs of an ectoparasitic Trematode are deposited where it lives, on the gills or skin of a fish. The embryos develop in the egg-shells or capsules which finally burst, and then the young animals either remain on the same host or swim about for a short time. In the latter case they may spread to new hosts, especially if a school of fishes is in proximity, and settle down to the mode of life of their ancestors.

With the endoparasitic Trematodes it is different. Each worm retains in its long uterus an enormous number of eggs, only the first-formed or oldest of which are from time to time deposited in the organ of the host occupied by the worm (intestine, gall-bladder, urinary-bladder, &c., of a fish) and make their way out with the excrements. When the eggs reach the sea water their contained embryos are already advanced in organization, being provided with locomotory cilia and eye-spots; and, upon bursting the shells, are capable of spending a brief existence as free-swimming larvæ (Mir-

6-7 EDWARD VII., A. 1907

acidia). During this time they must find suitable hosts (snails, annelids, crabs, &c.), into the soft parts of which they penetrate. Here they remain immature, but their locomotory and sense organs degenerate, and they become so far transformed and so entirely different from either the free-living miracidium or the mature adult as to be completely unrecognizable, in which case the specific identity can only be made out by finding intermediate stages. It may also happen that the larva in the snail (called a sporocyst) does not transform directly or slowly into the adult form, but by a kind of internal budding produces clusters of cells that develop into new individuals, the old individuals becoming disintegrated and destroyed. The primary intermediate host may, in some cases, serve as food to a secondary intermediate host, which in its turn falls prey to the final host, in each case the parasite suffering a change of environment. Sooner or later—but always in the definitive host (a fish)—the parasite reaches its final development, becoming sexually mature and producing eggs.

The list of species studied at the Marine Biological Station in the course of my investigations is as follows—

I. TURBELLARIA.

1. *Micropharynx parasitica* Jägerskiöld.

(=*Pseudocotyle fragile* Olsson). On the skin of the barn-door skate, *Raja laevis* Mit.

II. ECTOPARASITIC TREMATODES.

1. *Tristomum molae*, Blanchard. On the skin of the sun-fish (*Mola mola* L.).

2. *Tristomum coccineum*, Cuvier. On the gills of the sword-fish (*Xiphias gladius* L.).

3. *Epibdella hippoglossi*, O. F. Müller. Skin of halibut (*Hippoglossus hippoglossus* L.).

4. *Acanthocotyle verrilli*, Goto. Skin of starry-ray (*Raja radiata* Don.).

5. *Pseudocotyle apiculatum*, Olsson. Skin of dog-fish (*Squalus acanthias*, L.).

6. *Udonella caligorum*, Johnston. Attached to tails of specimens of *Caligus* which are themselves parasitic crustacea on the skin of the cod-fish (*Gadus callarias* L.).

7. *Octocotyle scombri*, Kuhn. Gills of mackerel (*Scomber scombrus* L.).

8. *Dactylocotyle denticulatum*, Olsson. Gills of pollack (*Pollachius virens*, L.).

9. *Dactylocotyle phycidis*, Parona et Perugia. Gills of hake (*Phycis chuss* Walb.).

10. *Anthocotyle merluccii*, van Beneden et Hesse. Gills of silver hake (*Merluccius bilinearis* Mit.).

11. *Onchocotyle abbreviata*, Olsson. Gills of dog-fish (*Squalus acanthias*, L.).

III. ENDOPARASITIC TREMATODES.

1. *Distomum veliporum*, Creplin. In the oesophagus, stomach, and intestine of the barn-door skate (*Raja laevis* Mit.).

2. *Derogenes varicus*, O. F. Müller. Mouth, oesophagus, stomach of—

Salmon (*Salmo salar* L.).

Cod (*Gadus callarias* L.).

Haddock (*Melanogrammus aeglefinus* L.).

Pollack (*Pollachius virens* L.).

Herring (*Clupea harengus* L.).

Smelt (*Osmerus mordax*, Mit.).

Rose-fish (*Sebastes marinus* L.).

SESSIONAL PAPER No. 22a

- Eel (*Anguilla anguilla* L.).
 Wry-mouth (*Cryptacanthodes maculatus* Storer).
 Sculpin (*Acanthocottus scorpius*, L.).
 Sea raven (*Hemitripterus Americanus* Gmelin).
 Angler (*Lophius piscatorius*, L.).
 Halibut (*Hippoglossus hippoglossus* L.).
 Sand dab (*Limanda ferruginea* Storer).
 Greenland turbot (*Platysomachichthys hippoglossoides* Walb.)
 Rough dab (*Hippoglossoides platessoides* Fab.).
3. *Hemiurus appendiculatus*, Rudolphi. Oesophagus and stomach of—
 Salmon (*Salmo salar* L.).
 Smelt (*Osmerus mordax*, Mit.).
 Herring (*Clupea harengus* L.).
 Cod (*Gadus callarias* L.).
 Pollack (*Pollachius virens*, L.).
 Sand lance (*Ammodytes tobianus* L.).
 Eel (*Anguilla anguilla* L.).
 Sculpin (*Acanthocottus scorpius*, L.).
 Halibut (*Hippoglossus hippoglossus* L.).
 Greenland turbot (*Platysomachichthys hippoglossoides* Walb.)
4. *Lecithaster bothryophorus*, Olsson. (= *Apoblema mollissimum* Levinson).
 Intestine of—
 Salmon (*Salmo salar* L.).
 Herring (*Clupea harengus* L.).
5. *Distomum simplex*, Rudolphi. Intestine of—
 Salmon (*Salmo salar* L.).
 Rose-fish (*Sebastes marinus* L.).
 Stickleback (*Gasterosteus aculeatus* L.).
 Hake (*Phycis chuss* Walb.).
 Mackerel (*Scomber scombrus* L.).
 Sculpin (*Acanthocottus scorpius*, L.).
6. *Stephanochasmus sobrinus*, Levensen. Rectum of—
 Sea raven (*Hemitripterus Americanus* Gmelin).
 Wry-mouth (*Cryptacanthodes maculatus* Storer).
Lycodes sp.
7. *Stephanochasmus hystrix*, Desjardins. Encysted on fins of Winter flounder (*Pseudopleuronectes americanus*, Walb.).
8. *Deropristi inflata*, Molin. Small intestine of Eel (*Anguilla, anguilla* L.).
9. *Distomum racion*, Cobbold. Intestine of Haddock (*Melanogrammus aeglefinus*, L.).
10. *Distomum furcigerum*, Olsson. Stomach and intestine of—
 Winter flounder (*Pseudopleuronectes americanus*, Walb.).
 Greenland turbot (*Platysomachichthys hippoglossoides*, Walb.).
 Rough dab (*Hippoglossoides platessoides*, Fabr.).
 Wry-mouth (*Cryptacanthodes maculatus*, Storer).
11. *Lepidophyllum steenstrupi*, Odhner. Urinary bladder of—
 Wolf-fish (*Anarrhicus lupus*, L.).
 Eel-pout (*Zoarces anguillaris*, Peck).
12. *Distomum incisum*, Rudolphi (= *Distomum fellis*, Olsson). Gall-bladder of—
 Wolf-fish (*Anarrhicus lupus*, L.).
13. *Distomum fragile*, Linton. Intestine of Sun-fish (*Mola mola*, L.).
14. *Accacoelium contortum*, Rud. Gills of Sun-fish (*Mola mola*, L.).
15. *Accacoelium macrocotyle*, Diesing?. Intestine of Sun-fish (*Mola mola*, L.).

6-7 EDWARD VII., A. 1907

16. *Gasterostomum armatum*, Molin. Cæca and duodenum of—
 Sculpin (*Acanthocottus scorpius*, L.).
 Sea-raven (*Hemitripterus americanus*, Storer).
 Cusk (*Brosmius brosme*, Müller).
 Halibut (*Hippoglossus hippoglossus*, L.).
17. *Distomum* sp. (Linton, 1901, Plate XXXII., f. 359.) Intestine of—
 Halibut (*Hippoglossus hippoglossus*, L.).
 Sea-raven (*Hemitripterus americanus*, Storer).
18. *Distomum* sp. (Linton, 1901, Plate XXXII., f. 354.) Stomach and intestine of Killifish (*Fundulus heteroclitus*, L.).
19. *Distomum*, sp., an undescribed species. Intestine and cæca of Halibut (*Hippoglossus hippoglossus*, L.).
20. *Distomum*, sp., an undescribed species. Urinary bladder of Wolf-fish (*Anarrhicas lupus*, L.).
21. *Distomum*, sp., an undescribed species. Intestine of Wolf-fish (*Anarrhicas lupus*, L.).
22. *Distomum*, sp. (appendiculate). Intestine of Angler (*Lophius piscatorius*, L.).
23. *Distomum*, sp. (immature).—In black, fibrous cysts in stomach-wall of Angler (*Lophius piscatorius*, L.).
24. *Distomum*, sp. (immature). Encysted in skin of Cunner (*Otenolabrus aspersus*, Walb.).

To this list may be appended:—

Distomum, sp. (immature). Intestine of the Squid (*Ommastrephes illecebrosa*).

Distomum, sp. (immature). In the parapodia of an Annelid, *Nereis virens*.

MONTREAL, February, 1903.

XI

THE EGGS AND EARLY LIFE-HISTORY OF THE HERRING, GASPHEREAU, SHAD AND OTHER CLUPEOIDS.

BY PROFESSOR EDWARD E. PRINCE, DOMINION COMMISSIONER AND
GENERAL INSPECTOR OF FISHERIES FOR THE
DOMINION OF CANADA.

(WITH THREE PLATES.)

In view of the economic importance of the herring family (the Clupeidæ), of which some species, such as the sea-herring, the shad, sardine, &c., have a high commercial value, it is a matter of surprise that accurate information regarding the habits and life history of most clupeoids is not available, or, at any rate, not generally accessible. For a long period the most absurd opinions prevailed respecting the migrations and spawning of so familiar a member of the family Clupeidæ as the common herring of the Atlantic ocean and the North Sea. Pennant's version of the theory, universally accepted a century and a half ago, is so often referred to in works on fishing industries, that I quote somewhat fully from his 'British Zoology,' vol. III., London, 1769. 'The herring,' he says, 'are met with in vast shoals on the coast of America as low as Carolina, and in Chesapeake bay there is an annual inundation of those fish, which cover the shores in such quantities as to become a nuisance. We find them again in the seas of Kamtchatka, and possibly they reach Japan,* for Koempfer mentions, in his account of the fish of that country, some that are congenerous. The great winter rendezvous of the herring is within the Arctic circle; there they continue for many months, in order to recruit themselves after the fatigue of spawning, the seas within that space swarming with insect food, in a degree far greater than in our warmer latitudes. This mighty army puts itself in motion in spring. we distinguish this body by that name, for the word "herring" is derived from the German "Heer," an army, to express their numbers. They begin to appear off the Shetland isles in April and May; these are only forerunners of the grand shoal which comes in June, and their appearance is marked by certain signs, by the numbers of birds, such as gannets, and others which follow to prey upon them; but when the main body approaches, its breadth and depth are such as to alter the appearance of the ocean. It is divided into two distinct columns 5 or 6 miles in length and 3 or 4 in breadth, and they drive the water before them with a kind of rippling, sometimes they sink for the space of 10 or 15 minutes, then rise again to the surface, and in bright weather reflect a variety of splendid colours, like a field of the most precious gems. . . . The first check this army meets it divides into two parts, one wing takes to the east, the other to the western shores of Great Britain, and fill every bay and creek with their numbers; others pass on towards Yarmouth, the great and ancient mart of herrings; they then pass through the British channel, and after that in a manner disappear. Those which take to the west, after offering themselves to the Hebrides, where the great stationary fishery is, proceed towards the north of Ireland, where they meet with a second inter-

* There is an important herring fishery in Japan to which I refer on a subsequent page.

6-7 EDWARD VII., A. 1907

ruption, and are obliged to make a second division; the one takes to the western side, and is scarcely perceived, being soon lost in the immensity of the Atlantic; but the other, which passes into the Irish sea, rejoices and feeds the inhabitants of most of the coasts that border on it. These brigades, as we may call them, which are thus separated from the greater columns, are often capricious in their motions, and do not show an invariable attachment to their haunts. . . . Though we have no particular authority for it, yet as very few young herrings are found in our seas during winter, it seems almost certain that they must return to their parental haunts, beneath the ice, to repair the vast destruction of their race during the summer by men, fowl and fish. Some of the old herring continue on our coasts the whole year; the Scarborough fishermen never put down their nets but they catch a few; but the numbers that remain are not worth mention in comparison to the numbers that return.'

Dr. John Johnston, in his famous *Historia Naturalis, De Piscibus et Cetis*, lib. V., Amsterdam, 1657, ventured to give a more detailed account of the herring migrations off the British islands. His quaint Latin narrative may be thus rendered: 'Wonderful indeed are the particulars of the migrations of the herring. In former days they lingered in Norwegian waters as their home; but in our time they swim all round Britain in immense armies. About midsummer they seek the Scottish shores from the deeps, and they descend upon the English coast, being taken from Scarborough Castle to the Thames from the middle of August. Afterwards some are carried by currents into the English channel and there offer themselves to the fishermen until Christmas. Thence they swim along both sides of Ireland to the north ocean, as if circumnavigating Britain, and then disappear until June. Later they return as soon as winter is over.'

It is due to Mr. John Cleghorn, of Wick, Scotland, that this marvellous story of the herring's movements from northern waters was first discredited. In a paper read before the British Association, at Liverpool, in 1854, he set forth the following considerations unfavourable to the generally accepted theory:—

(1) Herring remain within narrow limits as local races, distinct in size, quality, time of spawning, &c., and do not migrate over immense distances. (2) Increased netting has not increased the total yield as compared with the previous twenty-five years, owing to the depletion of the local schools. (3) Catches at particular stations may be vastly increased; but the fish in restricted areas may be exterminated.* (4) On extensive open shores herring survive in numbers longer than in circumscribed areas, especially near large cities, where the fish always decline and disappear first.

There is now a general consensus of scientific opinion that all the important species of food fishes are local in their distribution and migration, the herring being no exception to this general rule. Not only are local varieties of herring distinguishable, but even on the same parts of a coast the herring schools have been separated into littoral and deep-water varieties. Thus, in Norway, a shore herring has been recognized, while a deep-water herring, which comes inshore at the spawning time only, has been similarly distinguished. Such littoral and deep-water schools of other marine creatures may exist, so that the fishermen of Nova Scotia who speak of the deep-water lobsters are no doubt right in regarding them as distinct from those habitually haunting the areas close inshore. The herring, on most shores where attention has been directed to the matter, appear to move off into open or deep water after spawning, the schools which continue to linger near shore being small and unimportant. It is, indeed, this existence of local schools of all kinds of fishes, which ensures most effectively the continuance of the fisheries as a commercial resource. Were the herring of a sea, like the North sea or German ocean, to move annually in one great body, it might be possible by effective and vastly increased methods of destruction to imperil them with

*Amongst the statements of the Royal Commission on Scottish Herring Fisheries, 1879, this occurs: 'Either from the operations of man, or from some other cause, the herrings have been deterred from entering firths and sea-locks in the same numbers as formerly.'

SESSIONAL PAPER No. 22a

total extermination, but the onslaught made by man and by the natural enemies of the finny tribes cannot destroy utterly all these local schools, to which reference has been made, and the recuperation of even depleted areas from more populous areas is no doubt Nature's method of constant restoration.

On the shores of Britain, excepting perhaps the southern shore, there are two spawning seasons annually for herring. Professor Huxley, in 1862, distinguished the spring and autumn spawning schools. Their periods of spawning are January to March, and from the end of August to the end of September,* the earlier spawning schools vastly surpassing in numbers the later or autumn schools. The migration in-shore of the fish about to spawn reveals a remarkable serial succession as the fishermen move from their northern fishing grounds to the south with the progress of the season. The following table shows the dates, from May to December, at which the herring fleet operates on the coasts of the British isles:—

BRITISH HERRING FISHERIES STATIONS.

	MILES DISTANCE FROM LAND.		MONTHS.	
	From	To	From	To
Scotland—				
Stornaway	15	20	May 12..	June 21
Shetland.....	2	10	" 15..	July 15
Orkneys.....	3	16	July 15..	Sept. 6
Wick	25	60	"	" ..
Lybster.....	10	40	"	" ..
Helmsdale.....	15	30	"	" ..
Banff	40	60	" 14..	" 30
Fraserburgh.....	5	65	" 1..	" 15
Peterhead.....	15	60	June	" ..
Aberdeen	30	70	"	" ..
Stonehaven.....	30	70	July 16..	" 3
Montrose.....	5	50	" 10..	" 13
Anstruther.....	15	60	"	" ..
Leith	15	20	June	" ..
Eyemouth.....	3	35	" 12..	July 30
England—				
Berwick.....	10	70	"	" ..
Sunderland North.....	5	70	"	" ..
Shields	10	70	July	August ..
Sunderland South	10	60	"	" ..
Hartlepool	10	50	"	" ..
Whitby	4	30	"	" ..
Flamboro' Head.....	8	50	"	" ..
Dimlington and Spurn.....	12	35	August....	Oct. ..
Cromer	10	30	Sept.	" ..
Yarmouth.....	7	40	October....	Dec. ..
Lowestoft.....	7	40	"	" ..
Southwold.....	6	40	"	" ..
Ramsgate.....	8	30	Nov.	" ..
Dover.....	6	15	"	" ..
Dungeness.....	5	15	"	" ..
Hastings to Beachy Head.....	5	15	"	" ..
Plymouth.....	4	10	Dec.	Jan. ..
Ireland—				
Kinsale.....	6	20	April ...	June ..
Fastnet Rock.....	10	20	"	" ..
Gailey Head.....	6	20	"	" ..
Queenstown.....	12	60	"	" ..
Isle of Man.....	6	30	"	" ..

* This is clearly shown by the Scottish Fishery Board's Reports, as the 'Crown' brand for 'full' herrings is affixed during the two periods, viz., February and March and again in July and August.

In Canada there is a spring and fall migration of the herring, the earliest fish coming inshore as early as the month of March, or as soon as the ice disappears; but they are of small size, poor in condition, and used chiefly for bait in cod fishing. Later the fine fat bank herring move easterly from the west, and are taken some distance off shore, but in June and July the best herring for market purposes are generally taken. The spring spawners deposit their ova in shallow water in May, while the fall spawners come in in the months of September and October, and besides containing large roes or milts are of much larger size than the earlier runs. On the Labrador coast very large herrings are taken, the season commencing as a rule at the end of August, and being carried on in September and October. They are regarded as of very superior quality.

Owing to its vast commercial importance, it is not surprising that the herring has formed the subject of many reports and disquisitions. In 1864 the well-known work treating solely of the herring, by Mr. J. M. Mitchell, appeared. It was entitled 'The Herring, its Natural History and National Importance,' and in that work the Arctic migration theory was finally demolished. Accurate information upon the eggs of the herring and the spawning grounds was long wanting, but the eminent Professor G. J. Allman, on March 1, 1864, assisted by Dr. Bain, obtained off the Isle of May, on the coast of Fife, a quantity of herring spawn which was found attached to the rocky bottom at $14\frac{1}{2}$ to 20 fathoms depth. In February and March, spawning, or 'full' herring were known to occur there in quantity, and dredges were used and divers were sent down in order to secure the eggs deposited under natural and normal conditions. The nature of the eggs and their mode of attachment to the sea bottom was thus finally settled. In 1874, some interesting experiments were carried out at Kiel, in Germany, the herrings' eggs being artificially fertilized and incubated under the supervision of a special commission in May, and the young fry, after hatching, were kept until the yolk bag was exhausted in the sixth day. Other eggs were obtained, later in the same year, and carefully studied, viz., in October. The United States Fish Commission, four years later, hatched herring at Gloucester, Mass., and in 1883, Professor Ewart, Mr. J. T. Cunningham, and Dr. J. Gibson, carried out further hatching experiments in Edinburgh. An exceedingly able naturalist, the late Mr. Geo. Sim, of Aberdeen, treated fully the spawning and feeding habits of the herring, in certain original papers, notably one included in the Edinburgh Fisheries Exhibition Essays, 1882, while authorities such as Meyer, Heincke, Dr. F. Day, Duncan Matthews, George Brook, Prof. J. A. Ryder, Mr. E. W. L. Holt, and Drs. McIntosh and Masterman, have added greatly to our knowledge of the herring and allied species. More recently Ehrenbaum, P. P. C. Hoeck and others have published fine memoirs upon the subject, and references to these will be found on subsequent pages.

A valuable series of young Clupeoids was recently obtained by me in certain rivers and harbours in Nova Scotia and New Brunswick, and formed the subject of my study at the Canadian Marine Biological Station, and I am able to add to our knowledge of these fishes, especially the anadromous alewife, kyack or gaspereau (*Pomolobus pseudoharengus*, Wilson, and *P. aestivalis*, Mitchell), and to present in succinct form my researches, along with the results of various other scientific workers, I also include some notes made on the gaspereau spawning grounds on the Washade-moak lake, St. John river, New Brunswick.

My first acquaintance with Clupeoid ova dates from April, 1885, when a batch of herring eggs, handed to me by Professor McIntosh, of the University of St. Andrews, occupied my attention, and I made drawings of the ova and of the young fry when they hatched out. These eggs, picked off the cart of a fish 'cadger' or pedlar in St. Andrews, Scotland, were placed in the tanks of the Marine (now the Gatty) Laboratory, where they were duly incubated. The eggs had been squeezed out of the ripe herring by the pressure of the fish heaped up in the cart, and in the mixed mass the sperms from the ripe males mingled with and fertilized the ova. The sun's rays had dried the outside of the spongy masses, and the inner eggs survived as clear glassy globes about $\frac{1}{20}$ of an inch in diameter, thus convincing'y

SESSIONAL PAPER No. 22a

demonstrating the hardy nature of the herring's eggs, a feature to which Professor McIntosh drew attention as a fact of vast importance from a fishery point of view. Indeed sufficient attention has not been directed to this fact, emphasized by Professor McIntosh, for there can be no doubt that the continued plenitude of the herring in waters, where immense fisheries have been carried on for centuries, is largely due to this hardness to which that eminent authority drew attention.

Man is but one of a multitude of destructive agencies making war upon the herring; whales, porpoises, seals, &c., storms, high tides and other physical causes, all add to the destruction. In Gloucester, Kent, and Northumberland counties, New Brunswick, herring spawn is heaped up knee-deep for many miles, after severe gales, in some seasons, and is then carried on to the fields for manure. 'It is impossible,' wrote Dr. Pierre Fortin, a Canadian inspector, more than forty years ago, 'to form a correct idea without seeing it, of the immense abundance of ova of the herring deposited on the Canadian coast, where the herring spawns. I have seen the shore at Pleasant bay, Magdalen islands, covered 2 or 3 feet deep with them for several miles, and oftentimes on returning to my vessel I have seen the sea white with milt for several acres round, though when I passed the same spot two hours before the water was of the usual colour.' On the Pacific coast of Canada the herring schools are no less abundant, indeed they are even more plenteous. From the Straits of Georgia to Queen Charlotte islands, and still further north along the Alaska shores belonging to the United States, the herring are incredibly abundant. Near Nanaimo, Vancouver island, the harbours and bays appear to be filled with solid masses of moving herring, and I myself in February, 1902, passed through a floating mass of dead herring extending for over two miles as I travelled on the mail steamer from Vancouver to Nanaimo. Whether these fish, which floated in a mass two or three feet deep, die from suffocation, being crowded in narrow inlets and bays, or from submarine explosions or poisonous volcanic influences, has not been determined. In 1883, Burrard Inlet, near Vancouver City, was filled with herring, and by seining on a very small scale over 1,700 barrels of herring were secured, with little labour, which were salted and shipped to Australia, where there was an eager demand for them. Herring oil extracted by cooking and pressure was valued years ago at 40 cents per gallon, and the refuse remaining was converted into fertilizer material. The Alaska Oil and Guano Company, the principal United States producers of herring products on the Pacific coast, sent in 1900 into the markets no less than 172,000 gallons of herring oil, extracted from about 60,000 barrels of herring, besides 1,200 tons of guano (valued at \$26,400), and 192 barrels of salted herring, valued at \$960, the oil alone bringing \$34,000. Other United States companies put up in the same season 3,000 barrels of salt herring, valued at \$14,000. The British parts of the Pacific coast are regarded as even more productive, and a great herring industry lies open for development. Certain bays along the Tsimpsean peninsula and at the northern end of the Queen Charlotte group, are crowded with fine herring in the spring.

On the western Pacific shores the herring are plentiful, and there is a very important fishery on the coast of Japan, where they come in in immense schools from the outside sea to spawn at the end of spring and in the early summer. The west shores of Hokkaido are famous herring resorts; but the schools are generally distributed where there is a cold under-current in spring.

It may be added that over 40,000 barrels of herring are used annually on the Atlantic coast in the lobster fishery of Canada, the value at \$1 a barrel thus amounting to \$40,000.

Other Clupeoids, such as sprats, pilchards, shad, gaspereau, &c., appear in similar stupendous quantities when moving to their spawning grounds, or schooling for other purposes. 'I have seen,' said Dr. Matthias Dunn, the Cornwall fishery authority, 'a single porpoise drive tens of thousands of pilchards at will, as easily as a dog could drive a flock of sheep.'

The Basque sardine fishermen take advantage of this habit of the porpoise (marsouin), and surround sardines and porpoises with their seine, permitting the porpoises

later to escape, as M. J. Kunstler describes (*La Question Sardinière*, Bordeaux, 1904): 'Pour pêcher, on recherche une bande de marsouins quel 'on suit jusqu'à ce qu'elle ait réussi à former un banc compact de sardines. Puis la senne est mise à l'eau, en même temps que les rameurs impriment au bateau un assez rapide mouvement en cercle. On entoure ainsi les marsouins aussi bien que les sardines.'

The eggs of the herring family have as a rule the form of small translucent glassy spheres, possessing a strong hard shell like thin transparent horn. They may cling together in spongy masses as bunches, or form a film of transparent pellets, on stones, algae, shells, &c., and leaving interspaces through which the water can flow freely, and thus aerate the eggs, or they may have the buoyancy of pelagic eggs and float freely at the surface (like the pilchard's and sprat's eggs), or lie loosely on the bottom, as is the case with the ova of the shad. Eggs which cling together like those of the herring are coated with a tenacious mucus, and as they fall through the water they are fertilized by the milt of the male, which beclouds the water, and on reaching the bottom the external cement hardens so that they bunch together, or cling firmly to foreign objects. Mr. Joel Ingersoll stated to the New Brunswick Herring Fishery Commission, in 1886, 'At Seal cove and Whale cove, at Seal cove particularly, (on Grand Manan island) I have seen the net warp become as thick as my arm with the herring spawn, and the nets and anchors covered also,' while Mr. Samuel Chaney, of Grand Manan, said, 'I have seen it on anchors and warps and on the nets in great quantities.'

In British Columbia the Indians lay twigs and tree branches on the shallow herring spawning grounds, and after they are coated with the eggs, they take the twigs out and either eat them, raw or dried, by nibbling the branches between their teeth, devouring the eggs as a great dainty.

All the Clupeidae have not dense heavy eggs, as already pointed out. There are, indeed, three types of ova:—

(1) The demersal or non-buoyant eggs which cling together and are attached to adjacent objects at the bottom, of which the sea-herring is an example. The alewife, kyack, or gaspereau, produces non-floating eggs, not so dense as the herring's but much heavier than those of the shad and less than one-half the diameter of the shad's eggs. They adhere to each other and to stakes, stones, &c., under water, and measure about $\frac{1}{10}$ of an inch in diameter (1.27 mm.). They are fairly hardy, and survive conditions that would be fatal to the eggs of the shad.

(2) The semi-buoyant eggs like the delicate spherical ova of the shad, $\frac{1}{8}$ or $\frac{1}{4}$ of an inch in diameter (3.29 mm.), and very pale amber in colour (Plate IX., fig. 22). The ball of yolk (*a*), which only fills about one-sixth of the chamber of the egg capsule, is very granular but contains no large oil-globule. The eggs are tenacious when laid, but harden under water, and do not cling to adjacent objects. They simply roll loosely on the rock, sand, or shelving flats in the non-tidal parts of rivers, where the shad spawns. The Twaite Shad (*Clupea finta* Cuv.) occurs in Britain and in European waters, but has not been recognized on this continent, though it is possible that it inhabits our coasts; indeed as Mr. Thomas F. Knight, in 'The River Fisheries of Nova Scotia' (Halifax, N.S., 1867), says, 'It is said by the fishermen of the Bay of Fundy that there are two species or varieties This opinion is not confirmed by any description of the shad by naturalists; they know of but one species.' It produces an egg (Plate IX., fig. 21) quite different in size and other features from the common shad or Allis shad, as it is called in England. It is a much larger ovum than that of *Clupea alosa*, being $\frac{1}{400}$ of an inch in diameter (4.25 mm.). Dr. Ernst Ehrenbaum has studied very carefully the egg of this species at the Biological Station, Heligoland, and he refers to a peculiar reticulated character possessed by the shell or egg capsule: thread-like thickenings forming a rectangular network, like a fine basket-work pattern, so that the shell externally appears as if divided into minute squares, some being incomplete (Plate IX., fig. 25). Ehrenbaum describes the egg in detail (Beiträge zur Naturgesch. einig. Elbfische, Wissensch. Meeresuntersuch, Bd. 1), as well as the larval, post-larval and adult life-history, and on a later page I refer to his elaborate account.

SESSIONAL PAPER No. 22a

(3) Finally, there is the typical pelagic or floating egg of some Clupeoids. All pelagic eggs are marked by translucency, buoyancy and extreme delicacy of structure; but the eggs of the sprat (*Clupea sprattus*, L.) and the pilchard or sardine (*Clupea pilchardus*, Walb.) are of unusual delicacy and buoyancy. The ova named are practically spherical; but one clupeoid ovum of the pelagic type is quite ellipsoidal, viz., that of the anchovy (*Engraulis encrasicolus*, L.). The eggs of the sprat were first discovered by Hensen in the Baltic, and were studied in detail by Professor Pouchet in Brittany, and Mr. J. T. Cunningham, who obtained them in the Firth of Forth. They are about $\frac{1}{25}$ of an inch (1.016 mm.) in diameter; some, not perfectly spherical, measuring $\frac{1}{20} \times \frac{1}{25}$ of an inch (1.01 \times .99 mm.), and the capsule is extremely tenuous, while the clear colourless yolk, which almost completely fills up the capsule, shows delicate interlacing lines or reticulations as though the yolk were incompletely divided into spheres. The pilchard's egg is similar, about $\frac{1}{3}$ inch (3.8 mm.) in diameter, of extreme translucency, but the yolk occupies only a portion of the chamber of the capsule. The yolk substance is divided into spheres, and in its midst is seated a large oil-globule.

The spawning season, breeding habits, number of eggs produced, and the time occupied in incubation, show great variation in the Clupicidæ. We have seen that the sea-herring spawns at two different seasons in the year, and that special areas are selected year after year, where the sea-bottom presents suitable features for the deposition of the eggs, a hard bottom being a necessity, and usually of a rough shingly or rocky nature. They spawn in 10 to 20 fathoms of water, the eggs, deposited by the ripe female, being fertilized before reaching the bottom, where they adhere to zoophytes, stones, &c. The number produced by one herring is found to range from 10,000 to 30,000 or 40,000, or even 60,000, and at 53° F. they hatch out in six to eight days, while at 33° or 34° F. they take thirty to forty days. Some recent observations by Dr. Jenkins embody many interesting results both as to the comparative productiveness of different varieties of the sea-herring, and the proportions of male and female found in certain captures of the fish carefully examined. He ascertained that eight autumn herrings had in different cases from 13,000 to 65,000 eggs, while five spring herrings had from 25,264 to 45,543, the mean number for the lot being 30,000. Dr. Fulton found that sixteen spring herrings had a mean of 31,768 eggs, the numbers in different fishes varying between 21,500 to 47,466. Jenkins shows that the number varies with the size and age of the fish, the smaller and younger having fewer. With regard to the proportion of the sexes authors are not quite agreed. Fulton found that among 3,457 examined 1,724 were males and 1,733 females, while Heinke found 822 females and 606 males among 1,488, and Jenkins 148 females and 155 males among 303.

On a lake near Kiel where the water is brackish, and communication with the sea has been cut off, ripe herrings were found to be considerably smaller than those got in the Baltic, and to have a lower fecundity. Five, for example, contained only from 4,245 to 7,950 eggs, the average being 5,615, and the earbones showed that the herrings were three years old, while their average length was 5½ inches, and their average weight 16.1 grammes, or a little over $\frac{1}{2}$ ounce. The average length of the autumn Baltic herring of similar age was 7 inches, its weight 39.5 grammes (1½ ounces), and the number of its eggs 15,709.

The sprat and pilchard, having pelagic or floating eggs, scatter them freely in the sea, and although certain spawning areas seem to be selected by these fish each year, the eggs they produce must be widely scattered in the water. The former spawns very early in the year, viz., January to May,* while the pilchard is later, probably May and June, or even subsequently, while in more southerly waters the period is in winter and early spring. Mr. J. T. Cunningham hatched out pilchard eggs in three days and the sprat take about the same short time, indeed the Clupeoids appear generally to develop rapidly, and whereas the salmon, trout and similar fishes, with large, heavy eggs, take from 90 to 160 days, normally rather less than the latter period, and even cod, had-

* Professor McIntosh obtained specimens abundantly early in May at St. Andrews, Scotland.

dock, flounder, and species which deposit small floating eggs in the sea, take from 15 to 30 or 40 days unless the temperature be high, when 9 to 10 days may be the time occupied in incubation, all the Clupeoid eggs hitherto studied appear to pass through the stages of embryonic development far more rapidly than the fishes above referred to. With the shad, and gaspereau or alewife, the conditions of spawning are wholly different, for both these fish leave the sea, which is their habitat, to spend a few weeks in rivers up which they ascend to spawn in fresh water at no great distance above tide limits. When the water temperature is 56° to 60° F., in late May or in June, the shad pass into their customary rivers, the males preceding the females. They ascend with considerable rapidity, and within 12 to 14 days are found crowded on the shallow sandy or pebbly areas, generally some tributaries of a large river, and deposit their minute semi-buoyant spawn. The number each fish produces is about 30,000, though large examples have been known to yield 60,000 eggs, or even double that quantity. They hatch out in 7 to 10 days, when the clear shallows are found to be alive with the wriggling jelly-like little larvæ. The alewife or gaspereau is usually somewhat earlier, and enters the rivers about the last of April or the early part of May, when the waters are in flood. They often mingle with the shad which follow them, so that the nets set for shad capture gaspereaux in great quantities. They are able to surmount falls and dams, if not more than 2 to $2\frac{1}{2}$ feet high, throwing themselves spasmodically forward and flapping the tail vigorously. The strongly serrated abdomen is said to aid in surmounting difficulties, but this is probably not so. Having gained the calm upper waters some distance above the reach of the tide, the spawning immediately commences. On moonlight nights the shallow waters present a much-disturbed appearance owing to the energetic movements of the mating fish, whose tails and fins project above the water as they rush hither and thither. In a few nights the process is over, and the fish within three weeks of their ascent are found descending in a very thin emaciated condition. Some remain until July, but as the eggs take a very short time in hatching out, the young fry are found abundantly before the end of June, as transparent worm-like creatures less than one-fifth of an inch long (4.84 mm.). The ova are smaller than those of the shad, viz., about $\frac{1}{20}$ of an inch (1.86 mm.), and they cling together by means of their adhesive capsules in masses, becoming attached to stakes, submerged roots, stones, &c. The yolk fills up the capsule, as in the sea herring and sprat, not leaving a large perivitelline space, as is the case with the eggs of the pilchard and shad.

It is an interesting circumstance that young larvæ of the Clupeidæ are not only distinguished by their exceptionally delicate structure and appearance, but by the absence or very sparse presence of colour spots or pigment. There is usually a linear series of black stars or minute spots along the straight elongated digestive canal and intestine (Plate VIII., figs. 2, 3, and Plate IX., figs. 14 to 16); but not scattered, as in so many young larval fishes, over the body, cranium, and embryonic fin-membranes, or even over the yolk-sac hanging below the body of the fish. But the most distinctive feature is the position of the anal opening or termination of the intestine—this aperture being in most fishes at a point distant about one-third of the body's length from the snout, more or less, some species having the anus midway along the ventral margin of the body; but in the case of herring, sprat, shad, pilchard and clupeoids generally, it is at a point about four-fifths distance along the under side of the body, and very near, therefore, the basal portion of the tail. The position is slightly nearer or further from the tail in different species, but in all it is so far posterior in position that a clupeoid larva can be immediately determined by that feature. Even in a non-clupeoid like the sand-eel (*Ammodytes*), with the anal opening apparently far back (*vide* McIntosh and Prince, Life Histories of Food Fishes, Roy. Soc., Edin., Vol. XXXV., 1890, Pl. XIII., figs. 6 and 7), it is nevertheless about semi-distant along the ventral line; and in the smelt its position is fully three-quarters of the body-length from the snout. Further, the notochord is in a number of cases quite diagnostic in appearance. This cartilaginous rod or primitive backbone is divided up into a series of seg-

SESSIONAL PAPER No. 22a

ments, like a horizontal column of draughts or disks in the herring, sprat and pilchard (Plate VIII., figs. 1, 2, 6, 7, 8 and 9), but in the shad and gaspereau (Plate VIII., figs. 10 and 11), its structure is that of an irregular network, or complex meshwork, as in most cases not belonging to the herring family. This peculiar regular arrangement of the notochordal cells is a striking feature and facilitates the recognition of many newly-hatched Clupeoids, when mingled with other fish-larvæ; but the extremely posterior position of the anus, usually with a little bay or indentation in the ventral marginal fin (Plate VIII., fig. 11, and Plate IX., figs. 17, 18, 19), and the regular series of stellate black spots, either in a single or double line, along the upper or the lower contour of the digestive canal, are, as far as at present known, characteristic of all the herring family. Other stellate spots of a black colour, few in number, may occur on the head around the cylindrical kidney tubes or on the caudal fin-expansion at the posterior termination of the notochord. These fishes, therefore, present a great contrast to the young stages of the majority of species of other families, in which elaborate arrangements of colour, yellow, reddish brown, orange, ochre, black, purple, blueish and greenish spots may occur, massed in many species as bars or patches along the body. The surface of the protruding yolk-sac may also be brilliantly diversified as well as the wide marginal fin-membrane. As the yolk and fin-membranes and the body generally in the herring, shad and clupeoids are usually colourless, their delicacy of structure and glassy transparency are thereby increased. Some, as the sprat, show absolutely no pigment at all when they emerge from the ovum (Plate VIII., fig. 8). The yolk, moreover, in most species, is comparatively small compared with the length of the elongated eel-like body, and does not form the exaggerated protruberance seen in so many fishes, e.g., salmon, trout, cod, &c. On comparing the newly-hatched larvæ of various species of clupeoids a considerable variation in their length is observable, the length of the sprat (*Clupea sprattus*) from the tip of the snout to tip of the tail is 3.6 mm. ($\frac{1}{4}$ inch), the pilchard (*C. pilchardus*), 3.8 mm. ($\frac{1}{3}$ inch); the alewife or gaspereau (*Pomolobus pseudoharengus*, Wilson), 5 mm. ($\frac{1}{2}$ inch); the sea-herring (*C. harengus*, L.), 5 to 7 mm. ($\frac{1}{4}$ inch); the Twaite shad (*Clupea* or *Alosa finta*, Cuv.), 4.25 mm. (less than $\frac{1}{2}$ inch, i.e., $\frac{1}{4}$), and the common shad (*Alosa sapidissima*, Wilson), 9.29 mm. ($\frac{3}{4}$ inch). Thus, the pilchard would appear to be rather more than one-third of the length of the shad, the gaspereau rather more than half, the Twaite shad less than half, and the sea-herring considerably more than half the size, while the sprat is about the same length as the pilchard on hatching. This variation is a most striking one, but it is no key to subsequent growth during the larval and post-larval stages of the species referred to.

By the sixth day after hatching, the Twaite shad (Plate IX., fig. 13), according to Ehrenbaum, doubles its length, being 8.7 mm., or rather more than $\frac{1}{2}$ inch: a length which the sea-herring does not attain until about the tenth day, though the herring, as above noted, is a much larger larva when it issues from the egg. The shad, like the sea-herring, almost doubles its length in ten days, measuring 15.73 mm. ($\frac{1}{2}$ inch), while the pilchard is stated to be 24 mm. ($2\frac{1}{4}$ inch) at that age, a measurement which no doubt needs confirmation by further observation. By the twentieth day the herring (Plate VIII., fig. 2) exceeds 10 mm. in length ($\frac{3}{8}$ inch), the Twaite shad (Plate IX., fig. 14) is $\frac{2}{5}$ of an inch, and the common shad (Plate IX., fig. 19) $\frac{3}{10}$ inch, or about 19 mm. When double the age just mentioned, i.e., on the fortieth day, the herring is a little over half an inch long (2.69 mm.), the gaspereau is about the same length, 14 to 15 mm. (Plate VIII., fig. 10), but the shad still exhibits remarkable growth, being on the thirty-fifth day 56.95 mm. long, i.e., 2 to $2\frac{1}{4}$ inches long (Plate IX., fig. 20), while the Twaite shad, on Ehrenbaum's authority, is barely $\frac{1}{2}$ inch (20 mm.) (Plate IX., fig. 15), and reaching on the forty-third day a length of nearly an inch, 24 mm. (Plate IX., fig. 16). At the age of two months, or, to be more accurate, on the seventieth day, the herring exceed $\frac{7}{100}$ inch (18.9 mm.), whereas the shad is now 3 or 4 inches long (75 to 100 mm.), while by the fourth month the shad is stated to have doubled its length, being 5 to 7 inches long (125 to 175 mm.), as compared with the

sea-herring of the same age, which is 29 mm., or about $1\frac{1}{4}$ inches long. The gaspereau, from an experiment reported to have been carried out in Maine, U.S., by Messrs. Treat & Son, reaches a length only half that of the shad at the age when the shad is 3 to 5 in. long (4 months old). Of course, such fishes, when confined in rearing ponds, are probably dwarfed in their growth, and may not afford a certain clue to the determination of the age of specimens captured in their native waters. Shad have, for instance, been taken 3 to 4 inches in length in February, while specimens of the same length have been secured in great numbers in September; and in the Potomac river examples 3 inches long are abundant in November, while about the first of that month shad 5 to 7 inches long are plentiful in the Maine rivers. According to my observations, the first-named specimens (3 to 4 inches long) must have been hatched out in November or December, a supposition which raises a difficulty, as shad enter rivers, in December and January, on the Atlantic coast, only as far south as Georgia and Florida, while the small shad of the size named, captured in September, as in the Potomac river, must have been hatched in June, though the main ascent is as early as April in that river. Shad 9 to $13\frac{1}{2}$ inches long are frequently taken in Canadian waters in October, and as these fish cannot possibly be only four months old, and must be the young of the year preceding, especially as shad 3 or 4 inches long are also captured about the end of October, and schools of fish 4 to 5 inches long are observed in December. We know that shad are apt to migrate along long distances of sea shore, as on the Pacific coast, where they have spread far from the rivers where they were originally planted, so that they are not so true to their native rivers as the salmon, and this may explain the very discrepant nature of the facts alluded to. In Florida shad ascend rivers in December, as already stated, while in the Savannah and Edisto rivers of Georgia they are found in January, in the Potomac in April, Delaware river in May, and in the Canadian rivers from the middle of May (in St. John river, N.B.) to the end of June, especially in the more northerly rivers, as the Miramichi. A month later, in July or August, the spawned fish descend to the sea again in very poor emaciated condition, and the young fry begin to descend about the same time, but go down more slowly.

It is, of course, a matter of much difficulty to trace the later history of the various species now under review, but some principal facts may be determined. Thus the small sea-herring 62 mm. ($2\frac{1}{2}$ inches) long taken in September cannot possibly be the fry of the July spawning schools, as such fry could not be more than about 1 inch long according to the foregoing account, nor is it possible for the fry hatched in April, May or June to be more than $1\frac{1}{2}$ to $1\frac{3}{8}$ inches long, making all allowance for great variations in growth. The herring $1\frac{1}{4}$ to 2 inches long found in January off the east coast of Scotland must be five months old, if they are, as Mr. Geo. Sim held, the fry of the August preceding, while similar young fish in June and July must be March fry. In its second year a sea-herring is 60 to 80 mm. long ($2\frac{1}{2}$ to $2\frac{3}{4}$ inches); though Hjort states his views that a length of $2\frac{1}{2}$ inches (50 to 60 mm.) may be reached in six months. The specimens of herring $3\frac{1}{4}$ to $4\frac{1}{2}$ inches frequenting St. John harbour in August (Plate I., fig. 5) are not likely to be the fry of the preceding spring and only four or five months old, nor of the previous fall (August or September), but of the spring or fall prior to that. A year later, when barely 3 years old, the fish are $4\frac{1}{2}$ to 6 inches long (114 to 150 mm.), though Hjort again holds that in $2\frac{1}{2}$ years a herring reaches 160 to 165 mm. ($6\frac{1}{4}$ to 7 inches) in length.* Herring 8 to 11 inches long cannot be less than 3 years old, and may be in their fourth year. Dr. Meyer decided after his studies upon the herring (30 years ago) that herring $6\frac{1}{2}$ to 7 inches long are only 2 years old, and that within one year after hatching they are 5 to $5\frac{1}{2}$ inches long, an opinion not confirmed by more recent researches. Sars, Nilsson, Sundevall and others do not support Meyer's views. Dr. Jenkins in his recent studies at Kiel states that the Baltic herring show the following growth: 1st year, $4\frac{1}{2}$ to $4\frac{3}{4}$ inches; 2nd year, $6\frac{1}{2}$ to $6\frac{3}{4}$ inches; 3rd year, $7\frac{1}{2}$ to $7\frac{3}{4}$ inches; 4th year, $8\frac{1}{2}$ to $8\frac{3}{4}$ inches; 5th year, $9\frac{1}{4}$ to $9\frac{3}{4}$

* The common opinion that the 'matie full' herring, 9 to $9\frac{1}{2}$ inches long, in Scotland is only 2 years old can hardly be correct.

SESSIONAL PAPER No. 22a

inches. The sprat, which on hatching out is only about half the size of the herring and one-third the size of the shad, is believed to reach a length of 3 inches in one year, in its second year it is said to be $4\frac{3}{4}$ inches and in its third year $5\frac{1}{2}$ inches long, while the pilchard, which resembles the sprat in so many points in its embryonic and larval life-history, is believed to grow much faster during its post-larval life. Professor A. F. Marion declared that the rate of growth is half an inch (1cm.) per month, so that the translucent larva $\frac{1}{2}$ inch long on hatching becomes a post-larval fish 1 to $1\frac{1}{2}$ inches long (20 to 40 mm.) when between one and two months old—a view very difficult to favour. The famous French authority holds that when 140 to 150 mm. they are ready to spawn and are not more than one year old. As compared with other Clupeoids a growth of a centimetre a month is of course unusually rapid. Mr. J. T. Cunningham obtained specimens which were only 8.5 mm. long ($\frac{1}{2}$ inch), and according to Marion's calculations these were less than one month old, while his other specimens (Mar. Biol. Assoc. Journal, Vol. II., p. 161, Pl. X., fig. 3) would be five months old, and the same size as the sea-herring at that age. Pilchards 3 to 4 inches long are abundant in October Mr. M. Dunn has recorded, and, at Marion's rate of growth, would be the fry of March or April ova; but on the Cornish coast, June, or even earlier, appears to be the spawning period, and it is impossible until more extended work has been done to accurately decide the rate of growth. It may be added that the southern or Mediterranean sardine is a smaller form (6 to $7\frac{1}{4}$ inches) than the northern sardine which ranges from 9 to 10 inches when adult, a size which corresponds with the Canadian pilchard (*Clupanodon caeruleus* Girard), of which mature specimens studied by me ranged from 209 to 237 mm. ($8\frac{1}{2}$ to $9\frac{1}{2}$ inches).

The rate of growth is of first importance, as it is a guide to the age at which the various species of the herring family reproduce. The matter is one upon which authorities differ greatly. The common sea-herring was supposed by Professor Huxley to reach maturity in its first year, as De Caux had ventured to surmise before.* Mitchell held that maturity was reached in eighteen months, while Meyer favoured the second year, when the fish he thought were 8 inches long, but at the present time the prevailing opinion is that in the third or fourth year these fish reach the spawning condition as Sundevall, Ljungmann, Jenkins and others hold. Such a form as the dwarfed Caspian herring is of course exceptional, and is found to be ripe when only $4\frac{1}{2}$ or $4\frac{3}{4}$ inches long, while land-locked herring such as the variety in the Windebyer Noor, near Kiel, spawns when $5\frac{3}{4}$ inches long, and in its third year after being hatched. The Baltic herring spawn when 7 inches long. The sprat, a species only one-third the size of the shad, and half the size of the average herring and gaspereau, spawns when $5\frac{1}{2}$ inches long (i.e., in its third year), that species being 3 inches long in its first year and $4\frac{3}{4}$ in its second year.

The movements of the young clupeoids, larval and post-larval, are interesting, and while much variety of opinion has existed amongst authorities, there is now a consensus of view which may be summarized as follows: The young fry, when newly hatched and far more delicate and translucent than most other fishes in the sea or in rivers, lie on the bottom for some time. The shad, it is true, was stated by Mr. Seth Green, to seek the main current in midwater in the rivers where it is hatched. 'How different this (he said) from the young trouts that lie almost helpless for 45 days and then are fain to hide behind roots and stone! Whereas these minute, transparent, gelatinous things, push boldly for the deep swift current, where they are too insignificant to be attacked by the great fishes.' It may be pointed out that, when liberated from the Seth Green hatching boxes, anchored in a current, the fry were bound to take to the swift water, 'with their heads up stream,' such delicate organisms being carried by the current away from the shallows. My own examination of the spawning grounds and 'nurseries' on the St. John river convinced me that the pebbly shores

* Professor Huxley, in his famous address at Norwich Fishery Exhibition, April, 1881, on 'The Herring,' admitted he had overestimated the rate of growth, in view of the results of the Baltic Commission investigations.

are the normal resorts of the fry of shad and gaspereaux, the transparent young being invisible as they securely lie amongst the shingle, sheltered from the rushing stream of water overhead. Even the sea-herring, hatched out on spawning beds at some depth, do not mount at once to the surface, but lie at the bottom (this stage is figured on Plate VIII., fig. 1), until they reach a length of 10 mm. ($\frac{1}{8}$ inch). When slightly larger the yolk is absorbed and larvæ 10 to 24 mm. long ($\frac{1}{8}$ to $\frac{1}{4}$ inch), (Plate VIII., fig. 2), ascend to the midwater level, where they linger until an inch or more in length (24 to 28 mm.), when they are found floating in countless myriads in the surface waters. The transparent, worm-like, almost colourless clupeoid larva begins to acquire some pigment or spots of colour after the small sac of food-yolk, suspended under the body, is absorbed (Plate VIII., fig. 2). Indeed, in the herring the eye is bright and silvery on hatching out, and Mr. Holt states that the mouth is open (Ann. of Nat. Hist., 1889, p. 370), though this does not, from my own study of herring larvæ, appear to be always the case. When about 1 inch long the post-larval herring move inshore, lingering near river mouths until they are 2 inches long (Plate VIII., figs. 3, 4), when they resort to midwater, and in the autumn following are again found inshore, having attained a length of 80 to 100 mm., i.e., 3 to 4 inches (Plate VIII., fig. 5). I have obtained them in harbours in August and September congregating with the gaspereaux and shad in large schools. The shad appears to be the most precocious of the clupeoids in its early development. The yolk is absorbed by the fourth or fifth day after hatching (Plate IX., fig. 18), though a remnant remains, near the liver, until the fifteenth day, but minute conical teeth are developed before the end of the first week of larval life. The young fish develop rapidly, and within three months, though still delicate transparent creatures 2 to 2½ inches long, they have all the fins well-developed, and the deep form of the adult is being assumed (Plate IX., fig. 20). Norris, in his 'American Fish-Culture,' Philadelphia, 1868, gives a figure of the shad at this stage (*see* Plate X., fig. 36), referring to it as three months old in the text, page 161; but a descriptive note, at the end, states that the fish represented, is two or three weeks old, a patent impossibility, and that it is copied from the first report of the Massachusetts Fish Commission. By November the young shad are 4 or 5 inches long and frequent estuaries and harbour mouths.* This stage is represented in Norris' book, figs. 2 and 3, opposite page 141, and as the figures are extremely interesting, I have copied them on my Plate X., figs. 37 and 38. The parent fish, it may be added, descend after spawning and are captured late in July or in August, in poor condition, hardly fit for food. Those that escape the estuary nets resort to sandy flats, to recuperate, which they do rapidly. At the head of the Bay of Fundy are extensive feeding grounds of the shad, where they improve and fatten so rapidly that the 'fall' shad are regarded as the choicest of all inshore fishes for table purposes.

The gaspereau, like the shad, undergoes rapid growth after hatching out in June, when it is 5 mm., or $\frac{1}{4}$ inch in length, for it trebles its length in about a month. I secured specimens in the Washademoak lake, River St. John, N.B., $\frac{3}{8}$ inch (15 mm.) long (Plate VIII., fig. 10), which were of extreme interest. As no published account of these larva has been given by me though I described them to Section IV., of the Royal Society of Canada, several years ago, I will briefly detail their main features. The extreme posterior position of the anus is marked, the otocysts are unusually large, a feature common in the herring family in the larval stages, the head is depressed and the colour spots are black, excepting a few yellow dots which appear around the pupil of the eye, and an orange patch occurs in the pronephric region, behind the pectoral fins. The large size of the translucent pre-anal fin is a notable feature. There are three rows of black spots at this stage, viz., a dorsal row from the crown of the head to the upper lobe of the tail, a second chain along the middle lateral line, and a third series along the middle abdominal line. I kept specimens alive and ten days later, when

* The capture on several occasions of shad 4 inches to 4½ inches long in New York harbour indicates a much slower growth than that generally favoured.

SESSIONAL PAPER No. 22a

the fish must have been 30 to 40 days old, they measured 16.5 mm. ($1\frac{3}{20}$ inch) (Plate VIII., fig. 11), and the rudiments of the dorsal fin are now seen as delicate rays, while the front part of the lower jaw is studded with minute teeth. A maxillary flap hangs from the upper jaw, this maxillary flap being prominent also in the young shad (Plate IX., fig. 19). Further, the notochord, as in the shad, consists of a network of irregular cells, unlike the regular notochordal disks, characteristic of the herring, sprat, &c. At this stage the pre-anal lobe, of great length, still forms a prominent feature, and is probably diagnostic of the gaspereau, though it is prominent in such a form as *Ammodytes*, the sand-eel. The globe of the eye is now black with pigment and the swim-bladder is visible as a large silvery almond-shaped sac with pigment (black) in its dorsal wall. Pigment is more abundant over the whole of the fish at this stage, the head, cheeks and throat being spotted plentifully with black, amidst which a few yellow stands of colour pass. In this stage, as in the previous stage, the dorsal fin membrane is very narrow, and forms a thin, rather meagre membranous ridge along the back from the shoulder to the tail. The pre-anal fin is still of disproportionate length and breadth, indeed, its breadth almost equals that of the trunk, a very unusual feature in fish larvæ, although in the shad it is a fairly prominent structure (Plate IX., figs. 18, 19). The tail is more distinctly spatulate, the hind margin being no longer rounded, but markedly flattened. Between this stage 16.5 mm. ($1\frac{3}{20}$ inch), and the stages figured on Plate X., fig. 26, when a size of 30 mm. ($1\frac{1}{4}$ inches) is attained, no intervening stages have been secured. The blunt rounded head, the stout, somewhat shortened body, and the large size of the eye and the paired fins, are in contrast to the similar stages of the herring (Plate VIII., fig. 4), and the shad (Plate IX., fig. 20). When 35 mm. long ($1\frac{3}{8}$ inches) (Plate X., fig. 27), the external features are practically the same, the pigment forming two lunate patches at the base of the tail being more marked; but the general translucency of the body is preserved and the pigment consists of very minute black specks scattered all over the dorsum, especially on the head and on the tail, a few spots occurring on the premaxilla, maxilla and mandible. Two features are worthy of special attention at this stage, viz., the shortness of the maxilla, which does not extend as far as a line drawn perpendicularly through the centre of the eye, whereas in the shad the maxilla extends considerably behind such a line (*vide* Plate IX., fig. 24), and in the herring (Plate VIII., fig. 5) barely reaches such an imaginary line, while again the snout is very acuminate and not bluntly rounded as in the shad and Twaite shad (Plate IX., figs. 23, 24). The strong serrations of the middle abdominal scales or scutes, so characteristic of the adult gaspereau, are already well marked (Plate X., fig. 29). A much older stage was obtained in St. John harbour, New Brunswick, about the middle of August, when specimens from 3 inches (75 mm.) up to 5 and $6\frac{1}{2}$ inches (140 mm.) were secured (Plate X., figs. 28 and 29). The specimens could not possibly be the young of the same season, and though one in ten was of the small size first mentioned and a fifth of them of the largest size, all presented much the same features and were practically adult in general external appearance. The scales are comparatively large, and completely clothe the body, and they differ much in form and size from the scale of the sea-herring of the same size (Plate X., compare fig. 30, a gaspereau scale, with fig. 31, a sea-herring scale, both scales being from the dorsum near the base of the dorsal fin). Hardly less distinctive is the series of abdominal scutes or middle ventral line of keeled scales. These, in the gaspereau (Plate X., fig. 30) are much more strongly pointed and projecting than in the young herring (Plate X., fig. 31), while the strong anterior process (*a*) is absent, or represented by a mere indication of a process in the posterior bifid margin of the scale. The sides and opercular surfaces are brilliant silvery in appearance, while the dorsum is of a dark purplish blue, thickly spotted with black. The orange or ochre tint, noticed in the early larval fish, still remains as a suffused tinge though far paler than when the gaspereaux are 30 mm. long. The paired and unpaired fins are very deeply spotted with black, whereas in the herring the fins are clear and transparent, and bear no black

spots excepting the tail-fin and a portion of the dorsal fin. In many specimens the dark lunar patches at the base of the tail still appear, while the dusky patch on the shoulder, absent in the herring, is distinct and remains in the adult. The very distinctive features referred to, and there are many others, are of aid in at once separating young gaspereaux from young herring of the same size with which they congregate in estuaries and harbours, or from the young shad, which are natives of the same rivers, though they do not seem to be as a rule found associated in the same schools of clupeoid fry.

The subsequent history of the adults of the clupeoids, whose life-history from the ovum onward has here been sketched, furnishes one of the most important subjects for marine biological research in the future. Apparently all alike resort to deep water, only to return to the inshore areas as the spawning time approaches. Specimens may be occasionally captured in estuaries and inshore areas long after the usual spawning time; but their occasional character emphasizes the general rule. Like the salmon, they disappear, and their whereabouts cannot be determined. With the return of the spring or the fall spawning time the herring schools come in from their unknown haunts, just as the shad and gaspereau revisit their chosen rivers in April and May, or the pilchard and sprat congregate in their breeding areas in the open sea far out from land, the former in May, June, July and later, and the latter in the earlier summer months, though both these fish, like the smelt, come in from deep water for some unknown purpose, when they are captured in immense quantities in October, November and December; often indeed as early as the last week in September in the case of the pilchard, or as late as the third week in January in the case of the sprat. Reproduction and feeding are the two main purposes which stimulate the migrations of fishes; but these do not explain the obscure movements referred to. Even Pennant ventured to so surmise (Brit. Zoology, vol. III., 1759). Of the pilchard, he says, that 'it appears in vast shoals off the Cornish coasts about the middle of July, disappears the beginning of winter, yet sometimes a few return again after Christmas. Their winter retreat is the same as the herring, and their motives for migrating the same.' It is remarkable that fishes so familiar as these clupeoids should present problems so difficult to solve; but as Frank Buckland wrote, and the words are almost the last he ever penned: 'It will be seen that we have a huge field of inquiry before us, the results of which will not assume the form of a scientific plaything; but of a key by which we may hope to unlock the mysteries of the vast ocean.'

(In the preparation of the plates I have utilized my own drawings made from the specimens studied by me; but I have availed myself of the excellent figures published in some of the memoirs referred to in the text. These last-named figures are as follows: Plate VIII., figures 2, 3 after Mr. E. W. L. Holt, 4 after Dr. P. P. C. Hoeck; 6a, 6b after Dr. F. Raffaele, 8, 9 after Professor W. C. McIntosh, 10 and 11 after Mr. J. T. Cunningham; Plate IX., figures 12-16 after Dr. Ernest Ehrenbaum, 17-19, 21-22 after the late Prof. Ryder, 23-25 after Dr. P. P. C. Hoeck; Plate X., figures 36-38 after Thaddeus Norris.—E. E. P.)

LIST OF REFERENCE LETTERS.

an.—anus.
af.—anal fin.
au.—otocyst or early ear.
caps.—egg capsule or zona radiata.
cf.—caudal fin.
df.—dorsal fin.
e.—eye.
int.—intestine or digestive canal.
mn.—mandible or lower jaw.

mx.—maxillary (upper jaw).
not.—notochord.
og.—oil globule.
pf.—pectoral fin.
pr. an.—pre-anal fin.
pvs.—perivitelline space.
vf.—ventral fin.
yk.—yolk.

EXPLANATION OF PLATES.

PLATE VIII.

- FIG. 1. *Clupea harengus*. Herring, newly-hatched larva 5 mm. x 12.
 " 2. " " post-larval stage 12 mm. x 6.
 " 3. " " advanced stage about 40 mm. x 2.
 " 4. " " advanced stage about 46 mm. x 2.
 " 5. " " $3\frac{1}{4}$ inches long. About natural size.
 FIG. 6a. *Clupea pilchardus*. Pilchard, egg containing embryo 1.6 mm. in diameter x 25.
 " 6b. " " newly-hatched larva, 1.6 mm. in diameter x 20.
 " 6c. " " post-larval stage, 9th day 5.5 mm. x 18.
 " 7. " " late post-larval stage 11.5 mm. x 10.
 FIG. 8. *Clupea sprattus*. Sprat, newly-hatched larva 3.6 mm. x 15.
 " 9. " " larva on 10th day x 20.
 FIG. 10. *Pomolobus pseudoharengus*. Gaspereau, post-larval stage 15 mm. x 6.
 " 11. " " later post-larval stage 16.5 mm. x 5.

PLATE IX.

- FIG. 12. *Clupea finta*. Twaite Shad, newly-hatched 4.25 mm. x 16.
 " 13. " " post-larval stage, 6 days old 8.7 mm. x 10.
 " 14. " " post-larval stage, 20 days old 14 mm. x 6.
 " 15. " " advanced stage, 30 or 40 days (?) old 20 mm. x 4.
 " 16. " " probably 45-50 days old 24 mm. x 3.
 FIG. 17. *Alosa sapidissima*. Shad, just hatched, x 9.
 " 18. " " post-larval stage, 5th day x 6.
 " 19. " " post-larval stage, 17th day x 5.
 " 20. " " post-larval stage, 41 mm. x $2\frac{1}{2}$
 " 21. " " egg containing early embryo.
 " 22. " " egg with advanced embryo.
 FIG. 23. *Clupea finta*, enlarged head of, when 57 mm. long x $2\frac{1}{2}$.
 FIG. 24. *Alosa sapidissima*, enlarged head of, when 61 mm. long x $2\frac{1}{2}$.
 FIG. 25. Portion of egg-capsule of *Clupea finta*, showing external reticulated marking, x 240.

PLATE X.

- FIG. 26. *Pomolobus pseudoharengus*. Gaspereau, 30 mm. slightly enlarged.
 " 27. " " 35 mm. "
 " 28. " " 3 inches "
 " 29. " " $3\frac{1}{4}$ inches "
 " 30. " " scale from the dorsal below the base of the dorsal fin, x 20.
 FIG. 31. *Clupea harengus*. Herring, scale from the dorsum below the base of the dorsal fin, x 20.
 FIG. 32. *Pomolobus pseudoharengus*, abdominal scale or scute from the median ventral ridge of the body x 20.
 " 33. " side view of abdominal scale or scute from the median ventral ridge of the body x 20.

PLATE X.—*Concluded.*

- FIG. 34. *Clupea harengus*, abdominal scale or scute from the median ventral ridge of the body x 20.
- “ 35. “ side view of abdominal scale or scute from the median ventral ridge of the body x 20.
- FIG. 36. *Alosa sapidissima*. Shad, young in advanced stage 44 mm.
- “ 37. “ “ “ “ 79 mm.
- “ 38. “ “ “ “ “ 95 mm.

PLATE VIII

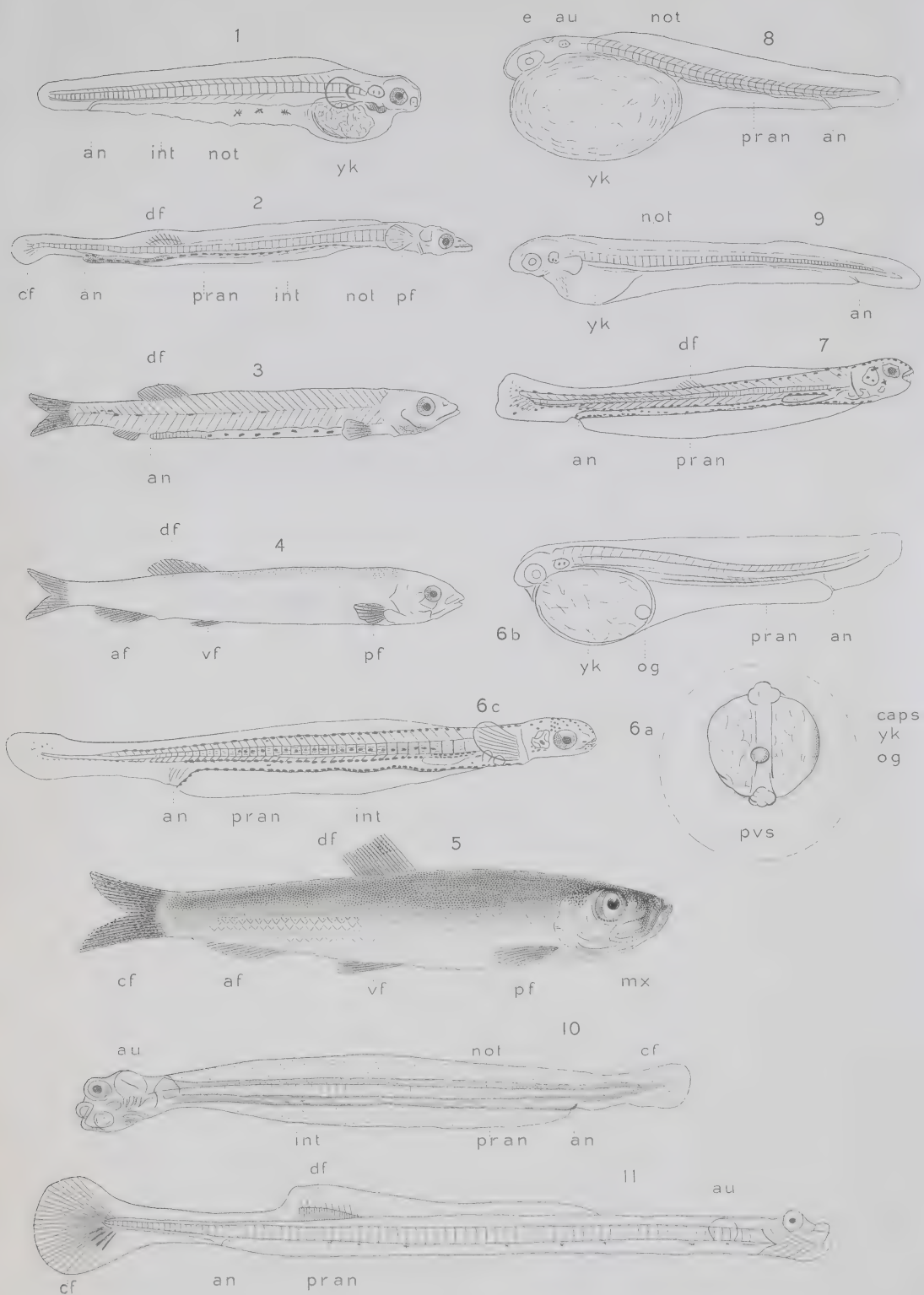


PLATE IX

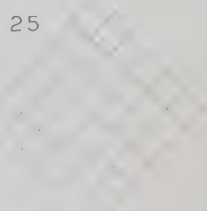
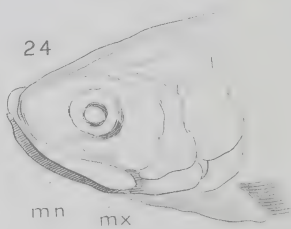
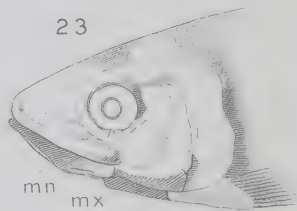
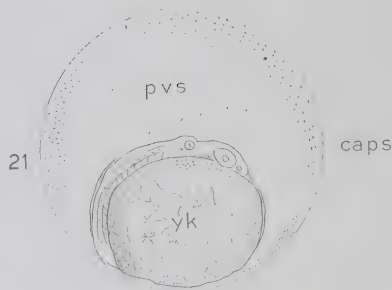
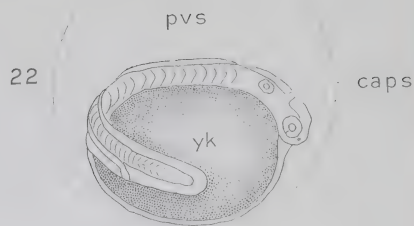
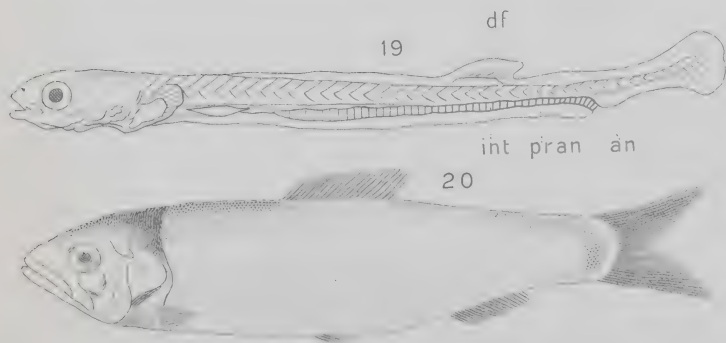
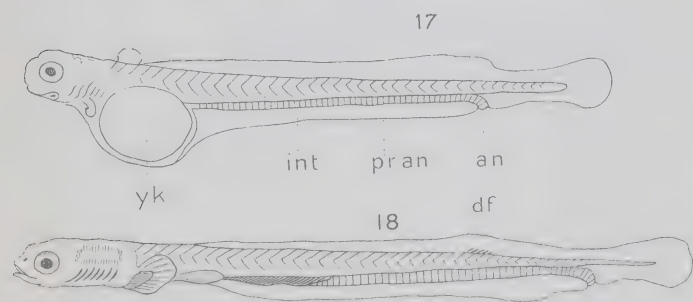
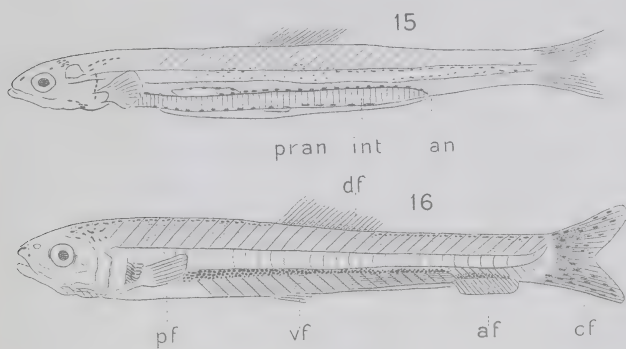
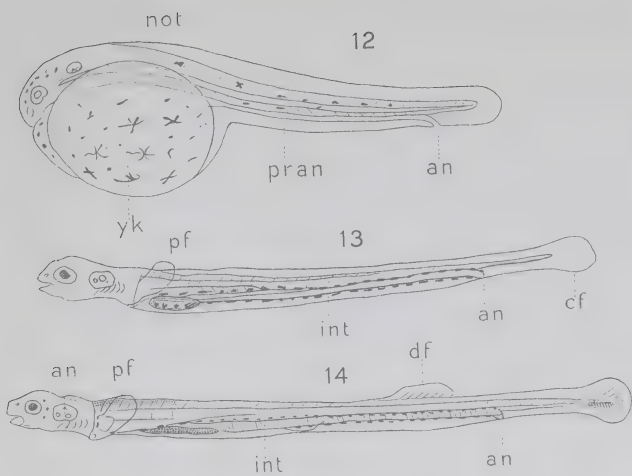
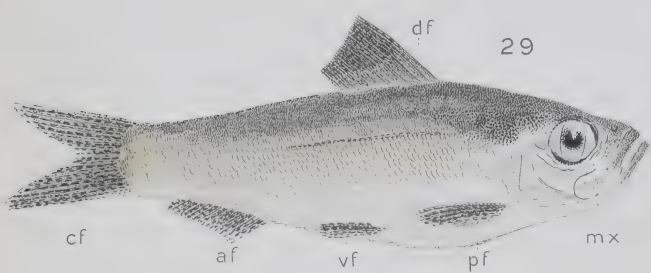
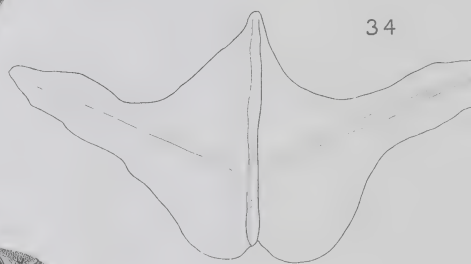
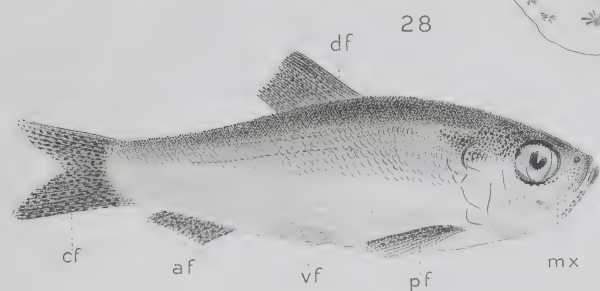
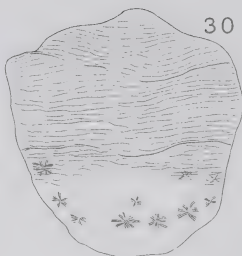
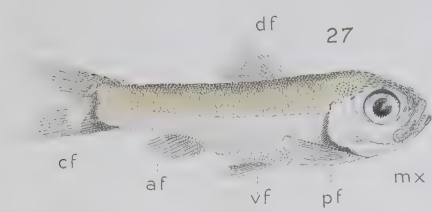
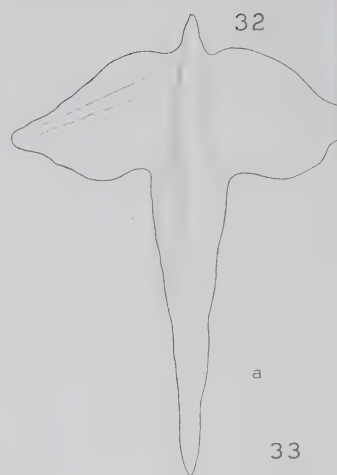
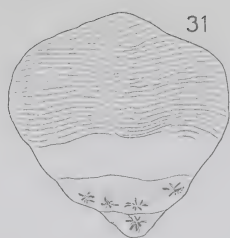
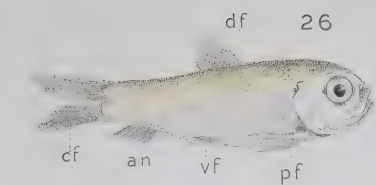


PLATE X



XII

SAWDUST AND FISH LIFE.

FINAL REPORT BY PROFESSOR A. P. KNIGHT, QUEEN'S UNIVERSITY,
KINGSTON, ONT.

The following concludes my report upon the effects of sawdust on fish life. The work was begun at the Dominion biological station, St. Andrews, in 1900, continued at the biological laboratory of Queen's University during the summers of 1901 and 1902, and concluded during the summer of 1904, by a series of observations which were made in tidal waters at different points along the coasts of Nova Scotia and New Brunswick.

LITERATURE.

Since my last report, completed three years ago, no new literature has been published on the subject in Canada, excepting in the annual reports of the Ontario Fish Commissioner for 1902 and for 1903. In his report for the former year the Ontario Deputy Commissioner of Fisheries says:—

'Ample opportunity of determining that sawdust is injurious to fish life has been given to the department while engaged in transplanting its bass, where the ice used has not been thoroughly rinsed. On an examination of the bass which had died in transmission, particles of sawdust were found between the gills, which it may be assumed caused the death of many of the fish. But the danger to and effects upon fish life from this pollution do not alone arise from this cause, but they are also due to the poisonous gases which are emitted from the decaying deposits; and these gases are not only most deadly to fish life, but they are a great menace to human health as well. It may be assumed that for this reason, in waters in the vicinity of old mill sites no fish are usually to be found.'

There are two points in this extract which require some elucidation. The first is the assumption that in transplanting bass, the fish that died on the journey were killed by sawdust. Before admitting this, one would need to know whether all the fish at the beginning of the journey were in vigorous health and strength. Can Mr. Bastedo assure us that the fish which died were not injured when they were being caught? Can he assure us that the water in which they were transported was thoroughly aerated on the journey? If not, the weaker fish and the injured fish would die from suffocation, not from the effects of a few grains of sawdust adhering to the ice. Mr. Bastedo's transportation tank may have been a veritable 'Black hole of Calcutta' for his poor bass!

The other point—that about poisonous gases—is not new to any one who possesses the slightest acquaintance with the literature of sawdust effects upon fish life.

Charles Hallock, writing in *Forest and Stream*, December 29, 1888, says:—'The old foundation walls and dams remain, and untold tons of tan bark and sawdust still cover the beds of the abandoned mill ponds, knee deep, all of it in a perfect state of preservation . . . nevertheless, the brook continues fairly stocked with small trout, despite the supplementary fact that it has been unmercifully fished ever since

6-7 EDWARD VII., A. 1907

the days of the "Mountain Miller," fifty fingerlings per rod being not unusual now for a day's catch.'

In the same magazine a writer who signs himself 'Piscator' answers the boggy about the effects of poisonous gases emitted by sawdust. 'He discourses on the poisonous gases from rotting saw-dust, and I will not waste space in refuting this idea, so flippantly put forth from time to time, but demand that the dead fish from such causes be produced in some single river or stream in America. It cannot be done, hence full-grown men should discard such transparent nonsense.'

Another quotation. Prof. Prince, the Dominion Fish Commissioner, in his report for 1899, says:—'There is no case on record of salmon or shad or any other healthy adult fish being found choked with saw-dust or in any way fatally injured by the floating particles.'

It is to be hoped that these quotations will convince all critics that the only way to settle the question of the effects of saw-dust on fish life is that suggested by Professor Prince, namely, by 'accurate and thoroughly scientific experiments.'

In his report for 1903, Mr. Bastedo again returns to the subject. He says:—

'Referring to the injurious effects of sawdust on fish life, as to which conflicting opinions are expressed by fish culturists, a writer in a recent number of *Forest and Stream* points out that one of the first difficulties which fish culturists had to overcome in the artificial propagation of trout was the deleterious effects of the fungus growth that always appeared in the troughs and boxes in which the eggs were hatched, especially where these were manufactured out of new lumber; and he makes the emphatic statement that this fungus is so deadly to the eggs that if a million were to be put into green lumber troughs, not a single egg would mature. He very pertinently remarks that if the exposed surface in a hatchery trough could be the primary means of such deadly consequences, what a master power for injury there must be in sawdust, in which form the exposed surfaces of the wood are multiplied almost indefinitely. If his conclusions are well founded, the effect of throwing tons of sawdust every year upon the spawning beds, or where it will float and lodge upon the spawning beds below must be most disastrous. In his opinion, it is this fungus alone that destroys the young fish that are exposed to it, and not that mortality occurs by the sawdust becoming fixed in the gills during inhalation, as is generally supposed. Whatever ground there may be for a difference of opinion on the subject, it is well known that fish will abandon streams the beds of which have become covered with this refuse.'

The following is the letter which Mr. Bastedo has summarized in the foregoing paragraph. It is regrettable that an official should try to settle the sawdust question by quotations from an anonymous writer, rather than by the slow and accurate method of scientific experiment. Quotations may be the only contribution which Mr. Bastedo can make, but he might at least furnish the public of Ontario with quotations from some more reliable source than from a nameless writer.

SAWDUST AND FISH LIFE.

(Extract from '*Forest and Stream*,' vol. 61-2, p. 490).

December 19, 1903.

EDITOR 'FOREST AND STREAM,'—Referring to the injurious effects of sawdust on fish life, will you kindly allow me to offer the following notes on the subject, from the fishculturist's point of view:

One of the first difficulties which the early trout breeders in this country had to overcome, was the presence of a fungoid growth that always appeared in the wooden troughs or boxes that the eggs were hatched in. It invariably grew on, and from the surface of, the wood that the troughs were made of, and in all our personal experience in hatching fish eggs, we never knew a single instance, east of the Mississippi, in which fungus did not appear on the surface of the wooden hatching troughs very soon after

SESSIONAL PAPER No. 22a

the water was turned into the troughs, unless the wood was very old or had long been water soaked. In these cases, the fungus does not appear to so great an extent, but when the lumber is new, the fungus, except in highly oxygenated waters, invariably appears very soon after the water comes in contact with the green wood.

This fungus is one of the most deadly things in the world to trout and salmon eggs. It is so destructive that if a million trout eggs were put into green lumber troughs to hatch, they would every one of them be killed before they hatched. Not one would escape. 'Domesticated Trout,' speaking of this fungus (page 126, sixth edition), says: 'Fungus is a vegetable growth of low order, which makes its appearance almost invariably where there is water, and especially on newly cut wood, on which it eventually becomes a mass of nearly colourless or milky slime.'

'This fungus, if once present in the hatching water, will certainly attach itself to the eggs, and when it does, their fate is sealed, you cannot save them from its effect, for it never lets go its hold. It will surely eat out the vitality of the embryo within, and will either kill it entirely or will leave a puny, lifeless, transparent creature, which will in all probability never live to grow up. It cannot, therefore, be guarded against with too much care.'

In consequence of this action on the surface of lumber under water, wooden hatching troughs were formerly charred, and now are all covered with a coating of asphaltum, on which fungus does not grow. No fishculturists of any experience would think for a moment of using wood for hatching trout or salmon eggs, without first covering every part of the surface with asphaltum, or something furnishing similar protection against fungus.

Now, if the exposed surface of the three planks which form the hatching trough can exercise such a deadly and universal effect on the fish eggs that are in it, what a vast power of injury there must be in sawdust, in which form the exposed surfaces of the wood are multiplied almost indefinitely. Take an inch board a foot square and reduce it all to sawdust, and it will give an amount of exposed surface almost infinitely greater than the board itself. Then consider what must be the effect of throwing tons of this sawdust every year directly upon the spawning beds of the fish, and where the sawdust will float down to the spawning beds below, if there should happen to be any below. From the moment the sawdust falls into the water it begins to produce the fatal fungus, and makes it absolutely impossible for a fish egg to hatch where it is, and what is more, the invisible fungus which destroys the eggs so effectually, gets into the gills of the young fish that are exposed to it and kills them also; and, besides this, by one of those wonderful instincts that are implanted in the lower animals, fish will avoid a stream where the conditions of spawning are unfavourable, and sooner or later will abandon a stream, the spawning beds of which are covered with sawdust.

The reader trusts that the above considerations are sufficient to show that large deposits of sawdust should be looked upon with much suspicion in streams that are valued on account of the fish life that is contained in them.

SALMO.

Of course, a fungous growth does occur upon fish eggs, but it does not necessarily come from sawdust. It is simply the case of an aquatic plant starting to grow upon organic matter—the eggs, or upon the bodies of the fry when these happened to receive injury in any way. I have seen such growths upon both eggs and fry, and that too in water that never contained a particle of sawdust. Whether this fungus is the same that grows upon rotting wood I cannot say, but of course every intelligent person nowadays knows that the rotting of all wood and trees, and the decay, putrefaction and death of animal tissues are alike preceded and caused by a fungus or bacterial growth which fastens upon the animal in the one case, or plant in the other, and ultimately causes the death of the individual.

But this fungous growth is an entirely different matter from the poisonous effects of sawdust. All wood cells, whether in the tea plant or pine, contain compounds that have been stored in the cell. When these cell contents are liberated and dissolve in

water we get a solution whose poisonous or other effects depend entirely upon the strength of the solution.

The experiments described in my second report showed clearly that the poisonous effect of sawdust water varies directly within the strength of the solution. A strong aqueous extract from sawdust is so poisonous as to kill in a short time nearly all forms of aquatic life. A weak solution is comparatively harmless. The question then of whether any particular stream is sufficiently polluted with sawdust to kill fish life is simply the question of determining whether enough sawdust has been passed into the stream to poison its waters. It is a question of the strength of the sawdust solution. There is no mystery about the matter. Any one who can understand the making of a cup of tea can understand the making of sawdust extracts. If we wish to make a strong cup of tea, we use plenty of the leaves and a comparatively small volume of water. If we wish to make an infusion we use a smaller quantity of the leaves and a larger volume of water. It is the principle which herbalists, druggists and medicine mongers have used for thousands of years. Senna tea, chamomile tea, not to speak of dozens of others, are examples of infusions such as we get by immersing sawdust in water.

Keeping this principle in mind, my work during the past summer consisted largely in ascertaining the quantity of sawdust discharged into a stream in a given time, and the total volume of water passing the mill in this same time.

The first mill visited was one located on the way to Little Harbour, a few miles from New Glasgow, Nova Scotia. The mill supplies lumber to the farmers in the neighbourhood. The timber, chiefly second growth spruce, and a little hemlock, is drawn to the mill during the winter. In the spring, when water is plentiful in the brook, the logs are sawn into boards, the sawdust and smaller refuse being discharged into the stream below.

The logs are all very small, and yield only from 40 to 100 feet per log. The total cut during the past few seasons averaged only 100,000 feet.

Previous to my visit, no rain had fallen for about six weeks, and consequently the mill was not running, on account of lack of water. The only water passing the dam was that from ordinary leakage. Below the mill, the brook was nearly dry. But in the spring and during summers when the rainfall was normal, smelt and sea trout came up to the foot of the mill dam, and were often caught with hook and line at the mill end.

The 'by-wash' at the side of the mill, by which the surplus water escaped when the mill was not running, was a very shallow flume about 14 feet wide, 80 feet long, and from 6 to 9 inches deep during the spring freshets. The total fall was 20 feet, consequently the slope down the by-wash was a very gradual one. The proprietor of the mill was of opinion that sea trout were able to pass up this by-wash and did ascend it every spring. At any rate, sea trout were caught every week by boys fishing in the mill dam. It was a common thing for boys from New Glasgow to go out to this mill pond on Saturdays and take home with them a string of trout in the evening.

Below the mill, there were none of the unsightly beds of sawdust and mill rubbish so frequently to be seen in Ontario streams. The tidal water from the Cumberland straits came up the East river, then ascended the mill stream to the very foot of the mill dam, and in returning carried away with it almost every particle of sawdust and rubbish which left the mill.

In this stream, therefore, there could be no question about the ascent of fish being stopped by mill rubbish. It was all carried down stream and away out to sea. The important question here was whether the ascent of anadromous fish was not stopped by the mill dam. If they were thus stopped, they could not reach their natural spawning grounds above. In this case, one can easily see how the supply of fish is cut off at its very source. My experiments and observations would seem to indicate that over-fishing on the one hand, and mill dams with no proper fishways, on the other hand, are

SESSIONAL PAPER No. 22a

more responsible for depleting our streams and rivers of fish than all the sawdust in all the streams in Canada put together.

Applying the principle of the strength of infusions to the sawdust and water in this stream, we can soon discover whether it is poisonous or not.

The water passing the mill in the spring, when the mill is not working, is a stream 14 feet wide, 6 to 9 inches deep, and flowing at the rate of 18 inches per second. Thus $14 \times \frac{3}{4} \times \frac{3}{2} \times 60 \times 60 \times 24$, or about 1,209,000 cubic feet of water will pass the mill every 24 hours.

Now, as a result of very careful calculations, supplied to me by the Messrs. Todd Bros., lumber merchants, of St. Stephen, N.B., it appears that in sawing logs into one-inch and two-inch boards, about one pound of sawdust is formed for every foot of sawn lumber, board measure. On this basis, 100,000 pounds of sawdust per season would be passed into this stream, and if the mill cut timber for 100 days per season, about 1,000 pounds of sawdust would be mixed with the 1,209,000 cubic feet, or about 75,000,000 pounds of water. Expressing the sawdust in the form of percentage, we find the solution would be .001 of 1 per cent.

Turning now to my laboratory experiments,* we find that a strength of .12 per cent killed a minnow in 20 minutes, and a percentage of .16 per cent killed a minnow in 90 minutes. That is, the pollution in this stream was only $\frac{1}{20}$ of the strength of the laboratory solutions. Of course, these figures are only approximations, but they point unmistakably to the conclusion that this small mill stream emptying into the East river and thence into Pictou harbour, is not polluted with sawdust sufficiently to kill fish life.

The next mill I visited was one on a branch of the Petitcodiac, a river which flows into the Bay of Fundy. The proprietors gave me the following information: The quantity of lumber that is cut ranges from thirty to forty thousand feet per day, during a season of five months, say 4,500,000 feet of lumber. The stream in high water is about 220 feet wide, and from 5 to 6 feet deep. The average velocity is 2 miles an hour. In August, when I was there, the stream was only about 50 feet wide, and the depth did not exceed 12 or 15 inches. Consequently, if we average these estimates it will be found that about 700,000,000 pounds of water would pass the mill every 24 hours. The sawdust, at the estimate of 1 pound for every foot of lumber cut, would amount to 35,000 pounds per day, or expressing these figures as percentage strength of solution, about .05. Here, again, therefore, there can be no doubt that sawdust does not kill fish life. But, here again, there are mill dams upon the stream with no proper fishways, and consequently anadromous fish cannot pass up to their spawning grounds. Add to this the fact that this and similar streams are all overfished year after year, and the amazing thing is that any fish are left in them at all.

AT ST. JOHN, N.B.

On arriving at St. John, I visited a number of the lumber mills and obtained a vast amount of information from a member of one of the largest lumber companies in the city. The annual cut of each firm, the kind of saws used—whether gang, band, or circular saw—and the mode of disposal of the refuse, were all carefully discussed. None of the mills in the immediate vicinity of St. John empty the sawdust into the river, but a few large mills and a considerable number of small ones far up the river and its branches, do discharge the sawdust and other refuse into this stream.

While, therefore, little refuse in the shape of slabs, edgings, butt ends, or bark, could be seen for many miles up the river, and no trace whatever of sawdust; yet, gradually, as I reached a part nearly halfway to Fredericton, there appeared evidence of the work of the lumber mills. Edgings, laths, logs, and sawdust were seen either floating or stranded plentifully along the shore. Opposite and above Maugerville this was

* See my 'Further Report' to Minister of Marine and Fisheries, published, 1906.

6-7 EDWARD VII., A. 1907

specially the case. The commonest kind of logs were spruce and cedar, and mingling with these a few pine.

In the upper half of the journey to Fredericton, a number of small sawmills were noticed here and there along the shore. Evidently they were doing a purely local trade. Quite a number had been abandoned. Nine miles from the capital there was brisk rafting of logs, no less than four steam tugs being employed in this work. The booms and logs extended for 4 or 5 miles along the river. All the mills along this part of the river were driven by steam and burnt their own sawdust.

Between St. John and Fredericton, therefore, there is no doubt that neither the rubbish nor the sawdust exists in sufficient quantity in the river to do any harm to fish life. But it becomes a matter of interest to ascertain, if possible, what the effect would be if the refuse from all the mills at St. John and up the river did discharge their sawdust, slabs, edgings, &c., into the stream. Because it must be remembered that up to 1899 the law against discharging mill rubbish was not enforced upon the St. John river, and certain other large rivers in Ontario and Quebec, inasmuch as parliament thought it only fair to the lumbermen to allow them the privilege of getting rid of their waste lumber in the easiest possible way.

Assuming then, that mill waste were discharged into the St. John river, what would be the effect? If it would poison fish eggs, fish fry, or the minute microscopic life which forms the food of fish fry, we can easily understand that this would be one reason why fish have decreased in number in this river during the past 30 or 40 years. Let us see. According to the information I received from lumber merchants in St. John, the following is a fair estimate of the cuts of lumber on this great river during the last year or two:—

	Feet, board measure.
Messrs. Burns & Murchin.	10,000,000
" Hilliard Bros.	10,000,000
" J. R. Warner & Co.	10,000,000
" A. Cushing & Co.	43,000,000
" Murray & Gregory	15,000,000
" Stetson, Cutter & Co.	30,000,000
" Randolph & Baker	20,000,000
" Dunn Bros.	10,000,000
" John E. Moore	10,000,000
" Miller Bros	23,000,000
M. A. Gibson	40,000,000
The Scott Lumber Co.	10,000,000
Messrs. Murchin & Sons.	5,000,000
R. A. Estey	7,000,000
A. Fraser	10,000,000
Tobique Lumber Co.	10,000,000
Van Buren Lumber Co.	13,000,000
St. John Lumber Co.	33,000,000
Geo. Murchin.	8,000,000
A number of smaller mills on the St. John and its branches in Canada and the United States. . .	90,000,000
	<hr/>
	407,000,000

Now, on the assumption that each foot of lumber, board measure, will produce a pound of sawdust, the total sawdust would of course amount to 407,000,000 pounds per annum.

So much for this part of the data required to find the strength of the sawdust pollution of the St. John.

SESSIONAL PAPER No. 22a

According to the Hydrographic Survey of the State of Maine (Walter Wells, superintendent, 1869), the total drainage area of the St. John river is 26,000 square miles, of which 7,400 lie in the State of Maine. The annual discharge from the area in Maine is 284,000,000 cubic feet. Using this as a basis, it follows that the annual discharge from the whole area will amount to about 1,000,000,000,000 cubic feet, or 62,000,000,000,000 pounds.

On the assumption that the saw mills run for about two-thirds of the year, say 200 days, it will follow that 407,000,000 pounds of sawdust mingle with about (40 trillion) 40,000,000,000,000 pounds of water. Expressing this in the form of percentage strength of sawdust solution, we get '001 as the result.

Comparing this again with my laboratory experiments, in which a solution of '12 per cent strength killed a minnow in 29 minutes, and another solution in which a strength of '16 per cent killed in 90 minutes, we see that even if all the mill refuse were discharged into the St. John the pollution would not be great enough to kill fish.

Moreover, we must make two allowances in the case of the St. John river. In the first place, much of the lumber is spruce, and according to my laboratory experiments of 1902, spruce sawdust was the least poisonous of all. In the second place, it must be remembered that St. John is the scene of the great reversible falls. During two periods of every 24 hours the St. John river falls into St. John harbour. During two other periods of the day the salt water of the Bay of Fundy pours into the mouth of the St. John river, the tide effects being felt as far up the river as Fredericton. This immense body of salt water, therefore, mingling with the fresh water of the river, lessens the strength of the sawdust pollution at the mouth and renders it still less likely to do harm.

BAY OF FUNDY.

One would suppose it quite as likely to hear that the Atlantic was polluted with sawdust as to hear that the Bay of Fundy was. And yet that is precisely what could be heard among the fishermen along the Bay of Fundy in 1877 and 1879.

In 1889, the late W. H. Rogers, inspector of fisheries, published what was known as *The Suppressed Sawdust Report*. Writing in reference to pollution of the Bay of Fundy, he says (page 2 of his pamphlet):—

'It has been stated that the falling off in the catch of shad in the Bay of Fundy was caused by sawdust; that fish swallowed it, and died in large numbers in consequence. The fact that ideas of this kind gained some credence led me to inquire more carefully into the matter, but not for my own satisfaction, because no such doctrine could be accepted by any one with the most limited knowledge of the habits of fish, or the natural laws governing them. The same idea had been exploded several times before in the case of other branches of the fisheries, notably the Digby herring fishery. My views and reports on this fishery will be found on file in the year 1879, and it will be seen that the state of that fishery since has fully sustained the position I maintained at that time. The average annual catch from 1870 to 1879, ten years, was 22,300 boxes, and from 1880 to 1887, eight years, 55,200 boxes. During the years 1877 and 1879, when the annual catch fell to about 5,000 boxes, sawdust was pointed to as the cause, and numerous signed petitions were sent to the government pressing for the enforcement of the law. My view was stated to be that the decrease was merely owing to a periodical fluctuation, with which sawdust had nothing to do, and that the fish would return in as great abundance as ever. And I appeal with full confidence to the facts, as stated, substantiating my view after an experience of nine years has thrown its light upon the subject. In 1887 the catch of Digby herring amounted to 74,135 boxes; the catch for 1888 is only 12,200. We may, therefore, expect again that large numbers of petitions will be sent to the government asking the enforcement of the sawdust law, so as to save the Digby herring fishery from destruction.'

THE STE. CROIX RIVER.

Returning again to the immediate subject of my report, I would like to call special attention to the conditions found at St. Stephen, N.B., on the Ste. Croix river.

This river has been the scene of lumbering and milling operations, I suppose, for over a hundred years. At first the trade was an export one with the mother country, the lumber being in the form of square timber. The many old wharfs at St. Andrews now in a state of utter decay may be taken as an index of the extent of these early lumbering operations. That a great deal of wealth was accumulated in these early days, both at St. Andrews and St. Stephen, from the trade in timber, is attested also by the remains of many fine private residences and grounds still to be seen in every street of these towns, but especially in St. Stephen.

Gradually, as the character of the lumber trade changed from the manufacture and export of square timber to that of deals and boards, the centre of this business shifted from St. Andrews to St. Stephen, because here there was magnificent water power. At one time—some thirty years ago—there were not less than 13 large saw-mills at St. Stephens, all discharging every pound of their sawdust into the Ste. Croix river. To-day there is not one-third of this number. The sawdust is still discharged, however, into the river, excepting that from cedar shingles, which is carted away and burnt.

During the many years that sawing has been carried on here, millions of tons of sawdust must have been passed into this river. When the tide is out, the sawdust is carried down below the town by the river's current, so that for practically a mile below, little or no sawdust accumulates along the banks. But beyond this point, for a distance varying from $1\frac{1}{2}$ to 3 miles, immense beds form, especially during July, August and September, when the water is low in the river. During the freshets of spring these beds are washed down and away out into Passamaquoddy bay.

Here then, if anywhere in Canada, we ought to find fish killed by thousands as a result of the fungus growths, poisonous gases, or other effluvia which have been so graphically described by those who have written upon the ill-effects of sawdust. But, strange to say, so far as I can learn, no unusual death rate among fish has ever been reported along the mouth of the Ste. Croix. On the contrary, there has been only the usual decrease in the catch of anadromous fish, such as has occurred along almost every river in the maritime provinces. The decrease has not been due to the effects of sawdust, but to deforestation, to overfishing, and to lack of fishways, or improper fishways, so that anadromous fish cannot pass up the rivers to their natural spawning grounds.

Moreover, Mr. Frank Todd, an unusually well-informed man upon all fishery matters, a gentleman who has been inspector of fisheries for this district for a number of years, tells me that he has caught hundreds of salmon at the tail end of the lowest mill on the river, where sawdust would naturally be most abundant; and that during every season for years he has watched salmon ascending the river towards their natural spawning grounds above.

Looking at the mills, the sawdust, the fishways and the annual catch of salmon by anglers, it is quite clear that sawdust has not destroyed the salmon fishing on the Ste. Croix river.

Turning now to look at the subject from the point of view of an infusion of sawdust in water, what do we find? Well, we find this: The annual cut of lumber at St. Stephen, board measure, is, according to Mr. Frank Todd, about 35,000,000 feet. According to Mr. Wells, from whose report I have already quoted, the annual outflow of water of Ste. Croix is 44,800,000,000 cubic feet, or, expressed in pounds, 2,800,000,000,000.

Now, if we express the weight of sawdust as percentage of the weight of water for two-thirds of the year, which is about the length of time that the sawmills run each year, we shall find that the solution is one of .002 per cent strength.

SESSIONAL PAPER No. 22a

Comparing this with fatal doses of sawdust poison as determined in my laboratory experiments already alluded to, it can easily be seen that no harm can be done to fish fry or fish eggs by the water at the mouth of the Ste. Croix river.

Moreover, another important factor must be taken into account. Tidal water rises about 3 feet at the ends of the lowest mills on the Ste. Croix. The sawdust is discharged, therefore, not into 123,000,000 cubic feet of river water daily, but into this amount of fresh water plus the tidal water of Passamaquoddy bay. This tidal water is of immense volume. When the tide is out the river averages 50 yards in width and four feet in depth for 5 miles below the mills. When the tide is in, this increases to 150 yards in width and 20 feet in depth. In other words, the volume of water into which the sawdust is discharged becomes fifteen times larger, and the strength of the solution becomes fifteen times less. Consequently, in tidal waters sawdust pollution is diminished and the poisonous effects, if any, are still further reduced below what they would be in a river that did not discharge into the sea.

CONCLUSIONS.

1. I submit the same general conclusion as I did in my report for 1902. No stream can be pronounced off-hand as poisoned by sawdust. Each stream must be studied by itself and the varying conditions must be thoroughly understood before a judgment can be pronounced. The chief things to be considered are (1) the quantity of sawdust and (2) the volume of water into which the sawdust is discharged. Subordinate conditions are the rapidity or sluggishness of the stream, the amount of sunlight or shade and the character of the water, whether from agricultural lands or from primitive forests.

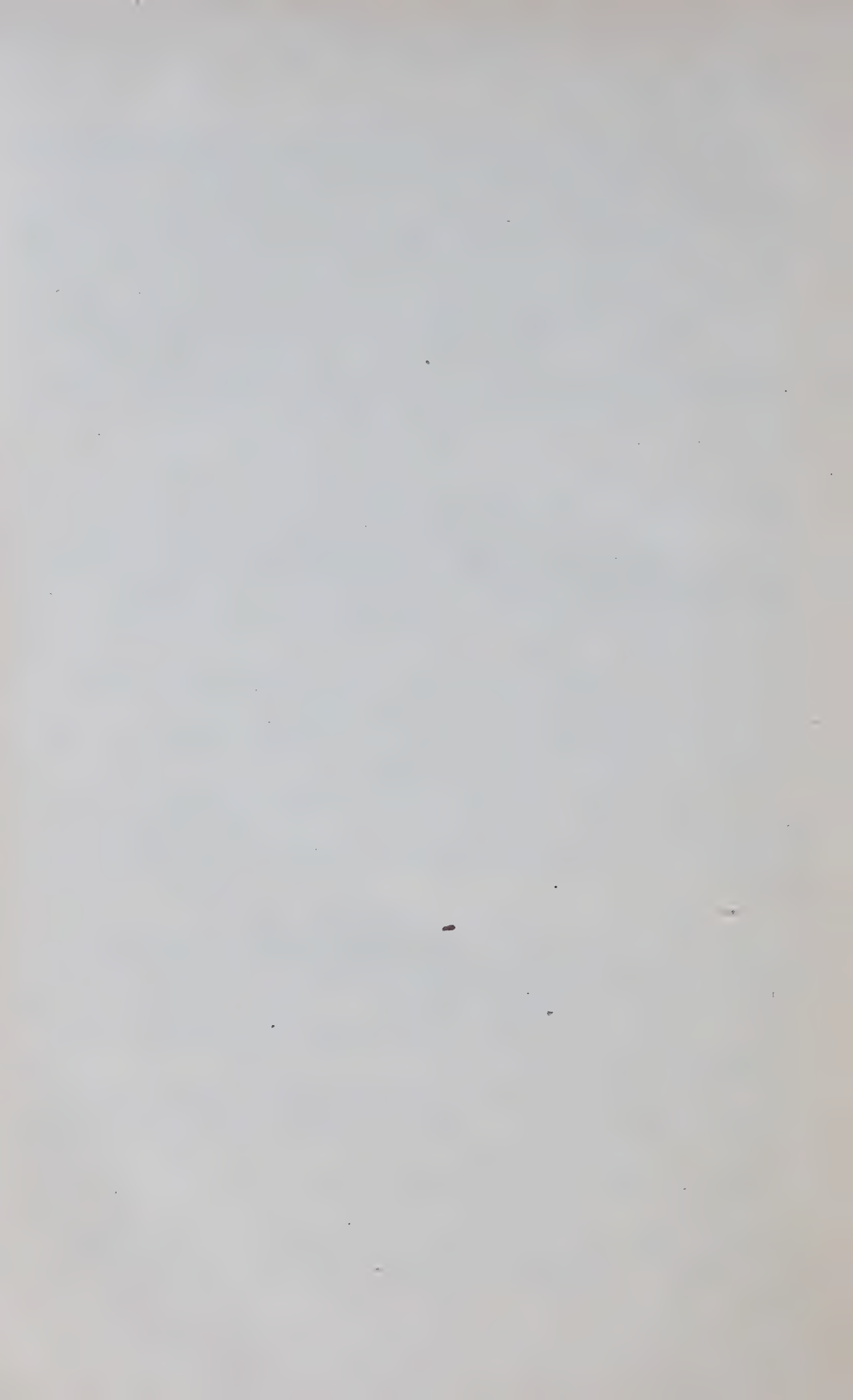
2. I have not the slightest hesitation in saying that no stream or river which I have yet studied in Ontario, New Brunswick, or Nova Scotia, is sufficiently polluted with sawdust to destroy half grown or full grown fish.

3. The varying strengths of sawdust solutions that will kill different kinds of fish eggs have not yet been determined. Perch eggs were hatched out in the university laboratory in a solution of .03 per cent strength.

4. In place of sawdust being the potent factor in the destruction of fish life, it would seem likely that mill dams are the real cause. Mill dams without proper fishways prevent the ascent of anadromous fish to their natural spawning grounds, and thus cut off all chance of natural propagation. As suggested in a recent report by Professor Prince, the question of the adequacy of fishways is a vital one to Canadian fisheries.

5. It would seem more reasonable to amend the Act against passing sawdust into streams, and make it approximate to that in force in the State of Massachusetts. In this state, it is provided that whenever the Fish and Game Commissioners should decide 'that the fish in any brook or stream are of sufficient value to warrant the prohibition or regulation of the discharge of sawdust from sawmills, and that the discharge thereof from any particular sawmill materially injures such fish, they could restrict the pollution by an official order.'

This would compel a personal inspection of a stream before an order could be issued to stop its pollution by sawdust. In this way both the interests of millowners and of the general public would be carefully weighed before the law would be placed in execution.



XIII

PROFESSOR MACALLUM ON THE CHEMISTRY OF MEDUSÆ.

A CONDENSED RÉSUMÉ OF RESULTS

BY PROFESSOR EDWARD E. PRINCE.

Commissioner of Fisheries and Director of the Marine Biological Station of Canada.

A detailed account of the laborious researches of Professor Macallum, F.R.S., on the inorganic composition of certain marine jelly-fishes or medusæ, appeared in the *Journal of Physiology*, Vol. XXIV., pp. 213-241. These researches were commenced in the summer of 1900, at the Marine Biological Station of Canada, and were continued during several seasons, with results so interesting in themselves and so suggestive in their theoretical bearings as to justify repetition in an abbreviated popular résumé. The conclusions which they appear to reasonably yield are, indeed, of such profound biological significance that I have ventured to prepare a condensed summary, divested as far as possible of technical phraseology.

The medusæ are amongst the most familiar of sea-side objects. These disc-shaped *Cœlenterates*, variously called jelly-fishes, sun-fishes and sea-nettles are, as Dallas said, 'wonderfully beautiful creatures, though the amount of solid matter contained in their tissues is incredibly small. The greater part of their substance appears to consist of a fluid differing little, if at all, from the sea-water in which the animal swims, and when this is drained away, so extreme is the tenuity of the membranes which contained it, that the dried residue of a jelly-fish, weighing two pounds, which was examined by Professor Owen weighed only thirty grains.*' The fluid or so-called jelly substance is, however, as Professor Macallum's researches show, not identical with sea-water. Professor Macallum began his investigations by placing jelly-fishes in vessels of sea water of various strengths, and by altering the proportions of individual salts, he endeavoured to ascertain the action of the salts upon these living organisms. As the exact composition of the jelly-fishes themselves was unknown, it soon appeared to him that no conclusive results were possible until the composition of the medusæ had been ascertained. Two species, it may be mentioned, were specially studied, viz.: *Aurelia flavidula*, Peron and LeSueur (closely allied to the European *Aurelia aurita*) and *Cyanea arctica*, the first-named ranging from 5 to 10 inches in diameter, in the late summer months when it is mature, while the last-named (*Cyanea*) may reach a size of 3 to 5 feet across the disc, although smaller examples are most common. Specimens of *Cyanea arctica* are on record having a diameter of not less than 7½ feet, and possessing tentacles over 120 feet long.†

Owing to their simplicity of structure, especially their histological features, there is a prevalent impression that jelly-fish imbibe, in sponge-like fashion, any fluids by which they may be surrounded, and Professor Loeb, of Chicago, has published the opinion that the existing chemical environment normally affects directly, not only the chemical constitution of medusæ; but their physiological activities as well, to a remarkable extent. The swimming motions or pulsations of *Aurelia* and *Gonionemus* are dependent, he declared, upon the presence of sodium, calcium, and potassium ions in their sea-water environment. Professor Loeb instanced an experiment in which a ring-like portion of the margin of *Gonionemus* was cut away, and the usual locomotor pulsations ceased in ordinary sea-water; but, when placed in a § normal solution

*Natural History of the Animal Kingdom, London, Griffin & Co., p. 70.

†Rolleston's Forms of Animal Life, 2nd Ed., Oxford, p. 788.

(i.e. 3.6 per cent) of sodium chloride, it rhythmically contracted for an hour or more. He decided that the margin differed from the centre of the disc in that species, and contained sodium, calcium and potassium ions in different proportions. The pulsations in the case of *Aurelia* did not cease after its margin had been cut off. Dr. Macallum found, however, that the contractions of the disc of *Aurelia* were rare and feeble in ordinary sea-water, after cutting away the margin of the disc, though very vigorous in the § normal solution of chloride of sodium; but he concluded that the salts did not act directly on the tissues, e.g., the nerve cells, muscles, &c., as Dr. Loeb thought; but on the nerve endings in the epithelium of the lower surface of the jelly-fish, usually called the sub-umbrella. This was clear from the fact that all contractions ceased when a 0.08 per cent solution of formalin in sea-water was gently brushed over the surface, or when the surface was so stroked with the back edge of a scalpel as to scrape the epithelium. These ectodermal cells, or epithelium elements, which form the thin covering over the gelatinous bell (mesoglaea) possess no markedly contractile character, and have assumed, in the morphologist's view, a function practically sensitive and protective alone, 'they have largely given up,' as the late Professor T. Jeffery Parker said, 'the function of contractility to the muscle processes or fibres.' This layer of living ectoderm prevents that direct influence, and interchange, which Professor Loeb regards as exercised by the chemical environment of the medusæ. Any rapid exchange between the outside medium and the salts in the tissues of the jelly-fish is barred, otherwise the composition of the 'jelly,' which forms so large a portion of the disc, would change with every change in the sea-water in which the creature floats, e.g., in passing from ocean water to brackish, and *vice versa*.

The gelatinous tissue or jelly is really a supporting lamella between the endoderm and ectoderm layers, but immensely thickened, as compared with the mesoglaeal lamella in *Hydra*, and it is very effective in impeding the exchange referred to, and indeed, in preventing the diffusion of foreign matters. Methylene blue, injected by a hypodermic needle into a vigorously pulsating *Aurelia*, was found to stain one spot only, and it was not possible to detect any spreading-out of the colour even after 24 hours interval. While the prevention of the diffusion of foreign substances is secured on the one hand, and the retention, on the other hand, is ensured of fluid and inorganic matters, the loss due to injury is also minimized and repairs to the surface are facilitated, even when such injuries are extensive. Thus, a third of the disc may be removed; but the naked cut surface is soon overgrown by a cuticle of small and glistening epithelium cells. The jelly consists of a minutely reticulated meshwork of proteid, called discin, which retains water and inorganic salts, and by its excessive firmness resists diffusion and osmosis so long as the trabeculae are maintained. Though the epithelial cuticle interposes a barrier against rapid exchange between the watery environment and the disc substance, and the mesoglaea itself resists the diffusion of foreign matters, yet the epithelial cells of the surface of the bell, and the lining cells of the gastro-vascular canals, exercise a remarkable selective power. They take in some chemical matters and reject others in the most unmistakable manner.

Before referring to the details of this interesting selective action of the cells as living units, and to the methods adopted by Professor Macallum in his researches, it may be necessary to point out that the composition of medusæ has engaged many observers. Krukenberg found in *Rhizostoma Cuvieri*, from the Adriatic, that the solids were 4.608 per cent and the organic 3 per cent; in *Aurelia* the solids were 4.2056 and 4.66 per cent, and in *Chrysaora hyoscella*, the percentages of solids were 4.25 and 3.7. Ladenburg found in two examples of *Aurelia aurita* from the Bay of Kiel, where the surface salinity is 1.7 to 1.8 per cent on the average, that the solids were 2.06 in one example, and in another 2.1 per cent. Krukenberg also attempted the estimation of the chlorine in medusæ from different localities, and found that *Aurelia* from east of the mouth of the Rhone showed 1.5975, and *Rhizostoma Cuvieri* showed 1.65075 per cent, as compared with specimens of *Aurelia* from the Gulf of Trieste and the Red Sea, which showed a percentage of chlorine as follows: 1.79275, 2.0306 and 2.2223, when

SESSIONAL PAPER No. 22a

the water of the sea contained respectively, chlorine percentages as follow: 1·8105, 1·931 and 2·0945. Other medusæ, from the same sources, Krukenberg found to contain chlorine greater in amount than in the surrounding sea-water, and he stated that in medusæ from waters of low salinity, their salinity was relatively much higher than in medusæ from sea-water of high salinity. He also found that a piece of jelly (in sea-water of 2·1868 per cent of chlorine) gave a fluid containing 2·334 per cent of chlorine; while, when the sea-water contained 2·272 per cent, the jelly fluid showed 1·345 per cent of chlorine—a most remarkable result, due to diffusion laws. Whether the loss of water, however, was owing to exudation or to mechanical processes, Krukenberg could not decide. In distilled water pieces yielded, he found, 4·93 and 4·13 per cent of chlorine, and in a medium containing magnesium sulphate only, the loss of salts decreased with the increase in the strength of the sulphate. A 6 per cent solution showed 4·33 per cent in the fluid given off, while in a 10 per cent solution it was 4·34 per cent; but in a 20 per cent solution the chlorine in the fluid was 3·229 and 3·666. With solid magnesium sulphate placed on the fragment of jelly, the fluid given off contained from 1·292 to 1·596 per cent of chlorine.

For the purposes of the St. Andrew's investigation it was necessary to have ample material to enable adequate analyses to be made. Hence a juice was prepared from living specimens of jelly-fish. The specimens were suspended in muslin bags in the station laboratory, for about ten minutes, so that the sea-water on the outside, and in the gastro-vascular canals internally, could drip away.

After this draining the specimens of *Aurelia* were subjected to a mincing process by hand, and the fine minced jelly was, after a second straining, kneaded thoroughly until liquified. The strained fluid, mixed with the kneaded material, presented a turbid appearance until the cellular elements settled, when the liquid was opalescent. Crystals of thymol were used for preserving samples, or else 2 cc. of formalin to 1000 cc. of the fluid. This fluid was stored in phials having tight-fitting glass stoppers.

As the canals in *Cyanea arctica* continue into the long dependent filaments, more time was necessary for the draining process in that species; but even after the lapse of an hour some sea-water still remained. There was in consequence of longer suspension some loss of organic material.

The specimens of *Cyanea* were then allowed to liquify spontaneously, after being broken up, and in the course of twenty-four hours a brownish red liquid resulted, in which the rosy tentacles remained undissolved. This was preserved by adding 2 or 3 cc. of formalin to 1000 cc. of the fluid. Preservation was satisfactory, but a precipitate settled in the *Aurelia* fluid, consisting largely of magnesium hydrate in union with some proteid matter. The medusa fluid or juice was subjected to elaborate analysis by Professor Macallum in the physiological laboratories of the University of Toronto, and the details require, of course, to be studied in the original paper, but the main results may here be summarized:—

(a) The sulphuric acid is much below that of the surrounding sea-water, absolutely and relatively.

(b) The magnesium is less than in sea-water, in *Cyanea* as much as 10 per cent less.

(c) The lime is the same as in sea-water at St. Andrew's and Canso in the case of *Aurelia*; but in *Cyanea* it is greater.

(d) The potassium shows the greatest disparity, being in *Aurelia* 40 per cent in excess of the amount in the sea-water and in *Cyanea* 100 per cent greater.

The selective action of the living cells forming the exterior covering and the internal (gastro-vascular) lining, is responsible, there can be no doubt, for the relatively large amount of potash salts taken in, and the ratio of the proteid nitrogen and phosphorus in one as compared with the other, viz., 1:2·5 is corroborative. The slight decrease in the sodium may be due to its replacement by potassium. The difference of the aqueous environment at St. Andrew's and at Canso explains the difference in the analyses of the specimens of *Aurelia* from the two places. Their subjection every

twenty-four hours to greater variations at St. Andrew's than at Canso during embryonic and larval life is the likely explanation. At St. Andrew's the extremes are no doubt in April and August, but at Canso the range of variation is limited, and due to the depth, &c., of the adjacent waters. The following chlorine determinations show this:—

Surface water, Canso, chlorine 1·6543.

Atlantic outside of Canso, chlorine, surface, 1·6032; 10 fathoms, 1·6302; 25 fathoms, 1·7262; 50 fathoms, 1·7476.

The degree of salinity in the surrounding medium affects little the presence of chlorine in medusæ. If once a salt of sea-water is appropriated by the jelly, it remains there for life, and any exchange must inevitably be slow. The jelly favours fixity and uniformity of concentration, and the epithelium cells are effective as a barrier. Professor Macallum's view is that heredity must be the cause of the selective power, whereby the cells accept the lime and sodium salts on the whole as they are in sea-water, and take in also the potash, but reject some of the magnesium and sulphuric acid. Whether, however, a power of choice was inherent from the first in medusæ, or developed as an acquired function, must be decided by the conditions regarded as obtaining in their ancestral progenitors, and the sea-environment in which they existed in past geological times.

Cœlenterates are a primitive type, indeed, the *Graptolitidae* of the Silurian age, and the Silurian and Devonian *Stromatoporida*, are generally regarded by palæontologists as hydroids, and there can be no question of the remains of Jurassic medusæ in the Solenhauten slates, and of at least one Cretaceous medusa; and the reference of these ancient forms to the order of (Craspedote) Trachymedusæ, and to certain orders of the *Acraspeda*, shows a striking stability in their morphological and structural features.

What must have been the environment of the early jelly-fishes? What were the surrounding conditions in the primitive seas which determined for these ancestral Hydrozoans that fixity of inorganic composition referred to? Professor Macallum points out that the primal seas, when life first appeared, must have contained a less quantity of salts, derived from the more readily decomposable rock materials, under the enormous atmospheric pressures, and at the high temperatures, at which vapour condensation first took place.

Biologists are well aware of the fact that the simplest forms of animal life (such as the Protozoan form *Amoeba*), while intolerant of extremes of heat, become sluggish as the temperature rises above 15° C. until at 30° or 35° C. movements cease altogether, but may be restored by lowering the temperature. If, however, the heat be raised to 40° C. heat rigour is produced, the protoplasm coagulates and the organism dies. There is, of course, a certain percentage of salts in solution in the fresh water in which *Amoeba* lives.

The sudden addition of 2 per cent of the chloride of sodium at once produces dry-rigor and general shrinkage; but if the change be gradual *Amoeba* will live in a 4 per cent solution, i.e., one twice as strong as that which results in dry-rigor, if the change is sudden. *Amoeba* has no barrier-membrane or cellular layer, but merely an ectosarc or slightly differentiated protoplasmic stratum externally. The contrast between the Protozoa and the Metazoa renders deductions unsafe, but, after all, Medusæ are low in the scale. Experiments with a remarkable fresh-water Medusa (*Crapedacustas sowerbii* Allm.*) discovered in the Royal Botanical Society's Gardens, Regents Park, London, some years ago, are interesting in this connection. Marine Cœlenterates are not very tolerant of fresh-water, and the Medusa just mentioned is the only non-marine jelly-fish known. Romanes found that it was even more intolerant of change. Dropped into sea-water at 85°F. (being a tropical species) it remained unaffected for 15 seconds, then there were two or three tonic spasms, lasting

*Professor Ray Lankester named it *Limnocoedium* at the time of its discovery. See *Nature*, Vol. XXII., 1880 (pp. 147, 177, 361, &c.).

SESSIONAL PAPER No. 22a

a few seconds, but in 30 or 40 seconds these faded into irregular twitchings. It became contracted and quiescent at the end of the first minute. On being replaced in fresh-water a strong spasm occurred after five minutes had elapsed, and for 20 minutes there was no motion. Irritability continued for some hours, as proved by pinching with forcèps, but the effects of the sea-water immersion proved fatal. It was found to live for some hours in brackish or very weak salt-water (1 in 12, or 1 in 15), and it lived for days in a still weaker solution (1 in 18). Marine jellyfish cannot endure a high temperature, indeed 70°F. is fatal; but this fresh-water form withstood 100°F.—its pulsations being 80 per minute at 65° to 75°F., while they increased to 130 per minute at a temperature of 85°F. Freezing killed *Crapedacustas*, whereas marine species have been frozen and on being thawed out, they swam about as usual. Again, marine species survive for hours in saturated brine, as Romanes proved. There is a parallelism, as Dr. W. B. Carpenter long ago pointed out between morphological differentiation and physiological differentiation, and the physiologist may well be impressed by the diverse animal forms, amongst the Metazoa, which are able to maintain a vigorous vitality in the midst of greatly changed or changing external conditions. They have within themselves the power of compensating for these changes in an extraordinary degree. Above all, the specialized and complex organization of man possesses surprising capability of resistance to, or rather, independence of, environmental changes. He is capable 'of sustaining the highest as well as the lowest extremes of temperature and of atmospheric pressure,' to quote from the distinguished authority just referred to. This resistance to varying external changes, is an inherent potency by which organic individuality is to no small extent maintained.

To return from this excursus to Professor Macallum's investigation, it seems clear that while the inorganic composition of *Aurelia* and *Cyanea* has acquired comparative fixity, the adaptation of these forms to changes in chemical environment is incomplete and variable. When the salts in sea-water were less abundant than they are now the medusæ would, doubtless, acquire a fixed relation to the relatively concentrated potash salts, while more tolerant of the salts of soda, as they became more concentrated. More than the usual amount of potash salts would be absorbed, in order to retain the physiological equilibrium; but this excess would diminish as the cells accommodated themselves to the altered relation between the potash and the soda salts. The power of taking up sodium and magnesium compounds would increase though not to such a degree as to take in the full amount present in sea-water. Further, the power to select lime would early approximate to the limit of the amount in sea-water.

The amounts, absolute and relative, are detailed in the following table:—

a. ABSOLUTE AMOUNTS IN 100 PARTS.

—	Sp. gr.*	Cl	SO ₃	CaO†	MgO†	K	Na	Total Salts.
Sea water, St. Andrews—April...	1018·03	1·347	0·15126	0·04105	0·14888	0·027184	0·74236	2·41704
" " " " August...	1023·79	1·7473	0·20257	0·05259	0·19344	0·035395	0·988235	3·16566
Aurelia, St. Andrews.....	1023·49	1·7174	0·13363	0·0515	0·17556	0·048745	.....	.....
Sea water, Canso— Δ = -1·825° C.	1022·78	1·6543	0·18931	0·04943	0·18377	0·033503	0·91898	2·98264
Cyanea, Canso— Δ = -2·137° C.	1024·42	1·6842	0·11349	0·048785	0·16946	0·068935	0·89926	2·9279
Aurelia Canso— Δ = -2·01° C...	1023·52	1·7231	0·12245	0·05375	0·18205	0·048103	0·925773	3·00175

* As compared with distilled water at 4° C.

† Given as CaO and MgO to facilitate comparison with the tables of Dittmar and Forchhammer.

‡ Cryoscopic determinations on carefully filtered juice in each case.

6-7 EDWARD VII., A. 1907

b. AMOUNTS RELATIVE TO CHLORINE (Cl=100).

	SO ₃	CaO	MgO	K	Na	Total Salts.
Sea water, St. Andrews—April.....	11.23	3.04	11.06	2.018	55.12	179.44
" August.....	11.59	3.001	11.07	2.025	55.82	181.1
Aurelia, St. Andrews.....	7.77	2.998	10.22	2.838	.....	.....
Sea water, Canso.....	11.44	2.988	11.11	2.032	55.55	180.3
Aurelia, Canso.....	7.11	3.118	10.56	2.792	53.9	174.2
Cyanea, Canso.....	6.73	2.89	10.06	4.093	53.38	173.84
Ocean water, Mean (Dittmar).....	11.576	3.026	11.21	1.997	55.27	180.584
" (Forchhammer).....	11.88	2.95	11.03	1.602	.....	181.1

That the amount of sulphuric acid is much below that in sea-water, both absolutely and relatively in *Aurelia* and *Cyanea*, is very noteworthy, and its slow rate of increase in sea-water must be the explanation of the low proportion. There are three equivalents of acid to one of lime in sea-water; but in river-water the acid equivalents are much smaller than those of the lime. Apparently it was not possible for the Medusæ to accommodate themselves to these external constituents in the same degree, owing no doubt to the physiological rate of accommodation being slower for sulphuric acid. The degree of accommodation to each constituent of sea-water varies very much, resulting in a deficiency in the case of sodium of 3.4 per cent, of magnesia 5.10 per cent, and sulphuric acid 32.36 per cent.

While these speculations are offered by Professor Macallum with reserve, they give interest to the well-known fact that some salts are relatively more abundant in their vascular fluids than in the media in which animals live, or than in their food.

The proportions of sodium, calcium and potassium, omitting for the moment magnesium, in the *Aurelia* and *Cyanea* juice, are strikingly similar to their proportions in mammalian serum and in Ringer's solution*, and indicate that these proportions in plasma are primitive and ancestral, and must date from a geological epoch when sea-water was poorer in salts of magnesia than it is now. In vertebrates and invertebrates of old, as in the Medusæ of to-day, the fluids in the vascular system might be compared to modified sea-water, so far as its inorganic constituents are concerned, and the physiological relation between the tissues and the salts in their vascular fluids, fixed primitively, continued hereditarily to their descendants, whether they changed their habitat from the sea to fresh-water or to the land. The low proportions of magnesium to sodium in vertebrate blood, and the high proportions in sea-water, must have been established when magnesia was less abundant than now in sea-water.

The view propounded by Professor Macallum implies that in the sea originated all animal life. 'The sea,' August Weissmann indeed declared, 'is the birthplace of all animal and plant life; and from it animals and plants have spread on to the land and into the fresh waters which permeate it.'

The jellyfish tissues have, it is clear, accommodated themselves to the high and increasing magnesium content of the ocean. Professor Loeb's idea that sodium ions are poisonous in sea-water, and may be antagonized by calcium and potassium ions in the tissues, mistakes and obscures the significance of the problem. The animal cell, exposed for ages to the three elements in its environment, has adapted itself to them, and the proper explanation of the third element's action is, that such a mixture of the solutions reproduces the primitive fluid-environment of the creature, hence the terms 'poison' and 'poisonous' are inapplicable.

*Ringer's solution is a mixture of salts favourable for the development and maintenance of contraction in cardiac and ordinary striated muscle.

SESSIONAL PAPER No. 22a

The physiological habit, established ancestrally, is maintained. Loew's idea that, because potassium salts favour chemical condensation-processes, this accounts for the high selective capacity for potassium possessed by animal and vegetable organisms, fails, however well-founded, and does not explain why medusa cells pack such salts away in the inert or dead jelly of the bell.

Reference may be made to other salts, small in quantity but important, and conveniently omitted in estimating the total sum of salts in sea-water and in the juices of medusæ. There is apparently no alumina in *Aurelia* and *Cyanea*, while the silica detected is so small in quantity that it may be due to sand particles, protozoan skeletons, &c., in the gullet and gastro-vascular canals, though the jelly of *Aurelia* may contain silica, as sponges and cœlenterates, of course, can utilize the silica of sea-water. The iron present is, in St. Andrew's *Aureliæ*, .0036 to .004 per cent, and in Canso *Aureliæ* .00087 (volumetrically), while in Canso *Cyanea* it is .001796 to .00207 per cent, whereas St. Andrew's sea-water contains only .00006 per cent and Canso sea-water slightly more, viz.: .00098 per cent. Phosphoric acid in *Aurelia* juice contains .013314 per cent and *Cyanea* juice .030315 per cent, but it must be noted that only a small portion exists in inorganic combustion, the rest being from nucleo-proteid and lecithin. Bromine in sea-water, according to the late Professor Dittmar, is .3402 of the total halogen, and in *Aurelia* from Canso, with a total halogen of 1.723, it would be .00586 per cent. Iodine, in 50 litres of sea-water, amounted to .0006, yet in contrast to analyses of sponges, repeated and careful tests with *Aurelia* and *Cyanea** failed to show the presence of that element. Another method showed its presence, but only .00001 to .00025 in 50 litres, and probably minute animals account for it. A very large quantity of the juice is necessary to determine its presence.† Does the gastro-vascular lining (i.e. the epithelial cells) reject iodides in sea-water, just as the sulphuric acid is rejected? If so, that is the explanation of the much smaller amount of iodine the medusa contains than the sea-water contains, in which it lives.

The conclusions yielded by the very elaborate and careful analyses of Professor Macallum, and summarised in the final pages of his paper, may be concisely stated as follows:—

1. Medusæ differ in their chemical composition, as regards salinity, from the sea-water in which they live, and two species differ from each other, in the same water and on the same day. Specific individuality is not signalized by morphological and anatomical features only, but is indicated by inorganic chemical composition as well.
2. The salinity of the sea-water environment may vary considerably, but affects very inconsiderably the salinity of organisms like medusæ.
3. Salts, once deposited in the jelly of living medusæ, are unaffected by osmosis while they continue to live in sea-water.
4. The sodium in medusæ is slightly less, and the potassium considerably more, than in the sea-water, taking the total halogen as the standard. The lime is about the same as in the sea-water, but the magnesia is less (as much as 10 per cent less), and the sulphuric acid very much less (32 to 35 per cent) in the medusæ.
5. The iron is more, and the iodine less, in medusæ than in sea-water; and the latter is apparently not associated with any compound which can be precipitated by alcohol.
6. The lining cells of the medusa's digestive system are living units, which exercise selection in absorbing the salts of sea-water, and this selection is more vigorous in respect to some constituents than others.

* 2 litres of the juice were used.

†The total amount of proteid in *Aurelia* is very small, only $\frac{3}{4}$ to $\frac{1}{2}$ per cent of its total weight; thus 2,000 cc. of juice only yields a total of 2.6 grains of proteids.

7. The different selective preferences exercised are explained by the past history of the sea-water environment. Magnesia and sodium steadily increased, but lime and potassium must have reached their present proportions ages ago; and the internal epithelial cells of medusæ accommodated themselves accordingly, although they have not yet accommodated themselves to the increasing sodium and magnesia.

8. The inorganic composition of medusæ, as shown by Professor Macallum's researches, reflects the composition of sea-water less of to-day, than of past geological periods, possibly very remote periods.

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20







